

TECHNICAL MEMORANDUM

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FROM:	Clinton Merrell, P.E., CFM 20 North Main, Suite No. 107 St. George, Utah 84770
DATE:	May 27, 2020
SUBJECT:	Disconnecting Impervious Areas to Increase On-site Infiltration and Reuse
JOB NO.:	446-20-01

BACKGROUND/PURPOSE

On February 26, 2020, the Utah Department of Environmental Quality (DEQ) General Permit for Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) was modified. This permit (Permit No. UTR090000) establishes the requirements most MS4s in the state of Utah must meet in order to discharge stormwater runoff to downstream surface waters under the Utah Pollutant Discharge Elimination System (UPDES). Section 4.2.5.1.2 of the permit states:

Retention Requirement. The Permittee must develop and define a specific hydrologic method or methods for calculating runoff volumes and flow rates to ensure consistent sizing of structural BMPs [Best Management Practices] in their jurisdiction and to facilitate plan review.

By July 1, 2020, new development projects that disturb land greater than or equal to one acre, including projects that are part of a larger common plan of development or sale which collectively disturbs land greater than or equal to one acre must manage rainfall on-site, and prevent the off-site discharge of the precipitation from all rainfall events less than or equal to the 80th percentile rainfall event or a predevelopment hydrologic condition, whichever is less. This objective must be accomplished by the use of practices that are designed, constructed, and maintained to infiltrate, evapotranspire and/or harvest and reuse rainwater. The 80th percentile rainfall event is the event whose precipitation total is greater than or equal to 80 percent of all storm events over a given period of record.

Washington City, a member of the Dixie Clean Storm Water coalition, asked Bowen Collins and Associates (BC&A) to determine how to quantify the increase in on-site infiltration and reuse of stormwater resulting from decreasing the amount of directly connected impervious area (DCIA) on a site. Specifically, BC&A evaluated the practice of disconnecting residential building rooftop drains

(rain gutters) from downstream directly connected impervious areas (driveways, sidewalks, etc). This Technical Memorandum (TM) will provide background on the hydrologic analysis of both directly-connected and unconnected impervious areas, demonstrate how to apply these hydrologic methods to residential development in Washington County, and provide recommendations for implementing the practice of disconnecting directly connected impervious areas as a storm water Best Management Practice (BMP).

ESTIMATING RUNOFF FROM DIRECTLY CONNECTED IMPERVIOUS AREAS

Many different hydrologic methods exist for estimating the magnitude of runoff from any given site. The "SCS Curve Number" method described in the National Resource Conservation Service's (NRCS) National Engineering Handbook, Part 630 (NEH-630) and NRCS Technical Release 55, Urban Hydrology for Small Watersheds (TR-55) is a popular method due to its relative simplicity and ease of use. The method requires the user determine a "curve number," or CN, for the subject drainage area based on the combination of land cover and underlying soil type. This curve number is then used to determine the estimated volume of runoff that can be expected to result from a given volume of rainfall.

In addition to land use and soil type, the curve number for a given drainage area is dependent on the presence of impervious areas. The effects of impervious areas are more significant when the impervious areas are "directly connected." According to NEH-630.0901(c)(1):

"An impervious area is considered connected if runoff from it flows directly into the drainage system. It is also considered connected if runoff from it occurs as shallow concentrated flow that runs over a pervious area and then into a drainage system."

TR-55 and NEH-630 provide several tables with typical CN values for various land cover and soil type combinations. Often engineers choose curve numbers directly from the TR-55 tables for their subject study areas. These table include descriptions for areas which include both pervious and impervious areas such as "Residential districts by average lot size." For these areas, the CN values listed include assumptions about the total percent impervious, directly connected impervious areas, and the hydrologic condition of pervious areas. If the subject area has different characteristics from those assumed to develop the CN values in the table, those values should not be applied to the subject area. Instead, NEH-630 provides additional equations and figures to determine the CN value representative of the subject area.

Another typically employed practice is to compute a composite CN value for a subject area based on an area weighted average of various land uses-soil type combinations present withing the subject area. While this approach is typically valid, special care should be taken in urban area hydrology where impervious areas are present in the drainage area. Per the limitations outlined in TR-55 page 1-4:

"The user should understand the assumption reflected in the initial abstraction term (Ia) and should ascertain that the assumption applies to the situation. Ia, which consists of interception, initial infiltration, surface depression storage, evapotranspiration, and other factors, was generalized as 0.2S based on data from agricultural watersheds (S is the potential maximum retention after runoff begins). This approximation can be especially important in an urban application because the combination of impervious areas with pervious areas can imply a significant initial loss that may not take place."

Where directly connected impervious areas are present, the New Jersey Stormwater Best Management Practices Manual (NJ SWBMP 2004) recommends using a weighted average volume

method instead of the traditional weighted average curve number technique. With the weighted average volume method, the runoff for pervious and impervious areas in a subject drainage area are calculated separately and added together. Example 5-2 of the NJ SWBMP manual illustrates the difference in runoff volume between the two approaches. In the example, 1.25 inches of rainfall on a 3-acre development site, with 1 acre of connected impervious area (CN 98) and 2 acres of lawn and woods (CN 65) results in the following runoff volumes:

Weighted Average Curve Number Method: 1089 cu. ft.

<u>Weighted Average Volume Method</u>: 3775 cu. ft. (impervious area) + 36 cu. ft. (pervious area) for a total of **3811 cu. ft.**

In this example, the weighted average volume method predicts approximately 3.5 times more runoff than the weighted average curve number method. Please refer to the excerpts of chapter 5 of the NJ SWBMP manual in Attachment A for the complete example.

It should be noted that when the commonly used hydrologic modeling software HEC-HMS is used to compute runoff volumes for drainage areas with impervious areas, the software uses an approach like the weighted average volume method recommended by the NJ SWBMP manual. HEC-HMS computes runoff volumes for the impervious areas and pervious areas separately if a percent impervious value is supplied for a sub basin element; however, for the impervious area, instead of using a curve number value of 98, the software assumes there are no losses for the impervious areas (i.e. CN 100) and all rainfall on those areas becomes runoff. If HEC-HMS were used for the Example above, the estimated volume would be:

<u>HEC-HMS with % impervious</u>: 4537 cu. ft (impervious area) + 36 cu. ft. (pervious area) for a total of **4573 cu. ft**.

The HEC-HMS estimate is the most conservative, predicting approximately 4.2 times the total runoff volume of the weighted average curve number method.

Based on these examples, a review of relevant hydrologic texts and experience, BC&A recommends using either the weighted average volume method or HEC-HMS with percent impervious for estimating runoff volumes from drainage areas with directly connected impervious areas.

ESTIMATING RUNOFF FROM UNCONNECTED IMPERVIOUS AREAS

When impervious areas are not directly connected to the downstream storm drain system, the areas are considered "unconnected." According to NEH-630:

"If runoff from impervious areas occurs over a pervious area as sheet flow prior to entering the drainage system, the impervious area is unconnected."

NEH-630 provides a separate figure (NEH-630 Figure 9-4) or an equation (NEH-630 Figure 9-4) to determine a composite curve number for drainage areas with unconnected impervious areas; however, according to NEH-630, when more than 30 percent of the total drainage area is impervious area the absorptive capacity of the remaining pervious areas will not significantly affect runoff, and the unconnected impervious areas should be treated as directly connected.

All sites considered in this study have total percent impervious values greater than 30%, therefore another method for determining the runoff volume from unconnected impervious areas was needed. The NJ SWBMP provides a two-step runoff estimation technique for drainage areas with unconnected impervious areas. When using this approach, runoff from the upstream unconnected impervious areas is computed, then added as an additional rainfall depth on the downstream pervious area it sheet flows onto. Example 5-3 of the NJ SWBMP manual demonstrates this method for a 1.25-inch storm on a 3-acre drainage area with 1 acre of unconnected impervious area (CN 98) and 2 acres of

lawn and woods (CN 65). The results of this example are summarized below, additional details are provided in the excerpts of the NJ SWBMP provided in Attachment A.

<u>Unconnected Impervious Area runoff volume</u>: 3775 cu. ft.

Impervious area runoff spread over 2 acres of downstream pervious area:

(3775 cu. ft.) / (2 acres) x (43,560 sq. ft. per acre) = 0.52 inches

<u>Total effective rainfall on downstream pervious areas:</u> 1.25 + 0.52 = 1.77 inches

Total site runoff off (1.77 inches over 2-acre downstream pervious area: 581 cu. ft.

The parameters of examples 5-2 and 5-3 (rainfall, total area, impervious area, etc.) are constant with the only difference being, the 1 acre of impervious area is directly connected in example 5-2 and unconnected in example 5-3. It is interesting to note the reduction in runoff volume between the two examples:

Example 5-2, one acre of directly connected impervious area: 3811 cu. ft.

Example 5-3, one acre of unconnected impervious area: 581 cu. ft.

Reduction from "disconnecting" one acre of impervious area: 3230 cu. ft. (85% reduction)

APPLICATION TO RESIDENTIAL DEVELOPMENTS IN WASHINGTON COUNTY

A primary goal of this study was to determine how to quantify the increase in on-site infiltration and reuse of stormwater resulting from decreasing the amount of DCIA on a site. Specifically, BC&A evaluated the practice of disconnecting building rooftop drains (rain gutters) from downstream DCIAs. Thirteen sites were selected from recent development projects in Washington City. Nine sites from two developments in residential, ¼ acre zoning areas, three sites from a development in a residential 1/8-acre zoning area, and a single site of townhomes in a Planned Unit Development (PUD) were selected. Although these sites were all within Washington City, they were qualitatively compared to other recent developments throughout Washington County and are similar enough that results from the analysis of the selected sites can reasonably be applied to similar new developments throughout the county, based on sound engineering judgement.

For each site, the curve number method described previously was used to estimate runoff volume for several scenarios. The hydrologic parameters for each scenario were developed as described below.

Rainfall

The UPDES permit for MS4s as cited previously requires each permittee to "prevent the off-site discharge of the precipitation from all rainfall events less than or equal to the 80th percentile rainfall event or a predevelopment hydrologic condition, whichever is less." The Utah DEQ Division of Water Quality (DWQ) published a guidance document titled "A Guide to Low Impact Development within Utah" (DWQ 2018) which includes guidance on how to determine the 90th percentile storm for a given location from historical daily rainfall data. Rainfall daily summaries were obtained from the National Oceanic and Atmospheric Administration (NOAA) website for St. George, Utah. Details regarding the weather station used can be downloaded from:

https://www.ncdc.noaa.gov/cdo-web/datasets/GHCND/stations/GHCND:USC00427516/detail

Following the procedure in the DWQ document, the 80th percentile rainfall depth for St. George, Utah was determined to be **0.44 inches**. This rainfall depth was used for all runoff estimates performed for this study.

Land Cover

For each selected site, 3-inch resolution, 2018 aerial imagery provided by Washington County was used to create polygons representing each of the following land cover types: directly connected impervious areas (driveways and public sidewalks), unconnected impervious areas (detached sheds and private sidewalks/concrete pads), roofs and lawns. The remaining portion of each lot was typically artificial desert landscaping and rock mulch with pervious weed barrier. The extent of each selected site was determined based on existing perimeter walls and extended to the top back of curb at the public roadway. For the purposes of this study, it was assumed that retention of runoff from the public roadways would be accounted for and treated separately from each individual lot in a subdivision. Site number one is shown in Figure 1. Figures for each site are provided in the detailed calculations in Attachment B.



Figure 1. Land cover map for Study Site 1.

Soil Type

Because all four hydrologic soil types are found throughout Washington County, each site was analyzed four times, once for each soil type. This approach facilitates the application of the results to other similar sites throughout the county.

Curve Number Selection and Runoff Estimates

For each site, curve numbers were selected, and runoff volume estimates were created for the following scenarios:

- 1. <u>Undeveloped</u> using TR-55 Table 2-2d CN value for desert in fair hydrologic condition (30-70% ground cover).
- 2. <u>Developed (Composite Curve Number)</u> using the weighted average (composite) curve number method. Composite curve numbers for each site were computed using the typical

values from TR-55 shown in Table 1. This scenario was analyzed for comparison with the more conservative weighted average volume method.

Land Cover Description	Curve	Curve Numbers for Soil							
Land Cover Description	Α	В	С	D					
Undeveloped (Desert, Fair)	55	72	81	86					
Natural Desert Landscaping	63	77	80	88					
Lawn	39	61	74	80					
Impervious Areas	98	98	98	98					

Table 1Curve Numbers Selected from TR-55

- 3. <u>Roof Connected (Weighted Average Volume)</u> This scenario is the same as the developed condition analysis, except the analysis was performed using the weighted average volume method described previously and in the NJ SWBMP manual. For this scenario, the roof of the main residence was assumed to be **directly connected** via rain gutters and yard drains to the downstream driveways, public sidewalks, and roadway storm drain system.
- 4. <u>Roof Disconnected (Two-step Runoff Method)</u> This scenario is the same as the "Roof Connected" scenario, except that the roof of the main residence was assumed to be **disconnected** from the downstream driveways, public sidewalks, and roadway storm drain system. Specific guidelines for ensuring the rain gutters are adequately disconnected from downstream impervious areas will be provided later in this TM.

The difference between the volumes computed in the "Roof Connected" and "Roof Disconnected" scenarios is the reduction in runoff achieved by disconnecting a site's roof from the downstream impervious areas. A summary of the results of the runoff volume calculations for each studied site is included in Table 2 below. Detailed calculations for each site are provided in Attachment B. For specific details and step-by-step examples of the weighted average volume and two-step runoff methods, please refer to chapter 5 of the NJ SWMP manual.

Table 2Summary of Runoff Volume Estimates

Site Parameters													
Site Number	1	2	3	4	5	6	7	8	9	10	11	12	13
Zoning Type				Res	idential 1/	4 Acre				Resid	lential 1/8	Acre	Townhomes
Zoning Code					R-1-10						R-1-6		PUD
Total Area (acres)	0.23	0.24	0.19	0.19	0.19	0.29	0.23	0.21	0.26	0.12	0.14	0.12	12.77
Impervious Area (acres)	0.15	0.11	0.12	0.09	0.11	0.10	0.15	0.12	0.16	0.08	0.08	0.07	7.11
Total Percent Impervious	64%	49%	63%	46%	57%	34%	64%	57%	63%	64%	57%	57%	56%
Overall Average % Impervious							56%	6					
Runoff Volumes from the 80th Percentile Storm (0.46 in)													
			Soil Ty	pe A									
Undeveloped (Desert, Fair) (Cu. Ft,)	0	0	0	0	0	0	0	0	0	0	0	0	0
Developed (Weighted Curve Number) (Cu. Ft,)	67	53	73	33	57	27	66	47	59	35	32	27	4756
Roofs Connected (Weighted Average Volume) (Cu. Ft,)	141	110	117	84	105	94	140	113	156	74	77	65	6813
Roofs Disconnected (Two-Step Runoff Method) (Cu. Ft,)	20	24	35	14	19	22	61	31	78	16	15	16	3538
Total Reduction in Runoff by Disconnecting Roofs (Cu. Ft,)	121	86	82	70	86	72	79	82	78	58	62	49	3275
Total Reduction in Runoff by Disconnecting Roofs (Gal.)	910	640	610	520	640	540	590	610	580	430	460	370	24500
Percent Reduction in Runoff by Disconnecting Roofs	86%	78%	70%	83%	82%	77%	56%	73%	50%	78%	81%	75%	52%
Average Reduction							74%	-	-			-	See Note 1
Soil Type B													
Undeveloped (Desert, Fair) (Cu. Ft,)	0	0	0	0	0	0	0	0	0	0	0	0	0
Developed (Weighted Curve Number) (Cu. Ft,)	67	53	73	33	57	27	66	47	59	35	32	27	4756
Roofs Connected (Weighted Average Volume) (Cu. Ft,)	141	110	117	84	105	94	140	113	156	74	77	65	6813
Roofs Disconnected (Two-Step Runoff Method) (Cu. Ft,)	20	24	36	14	19	22	61	31	78	16	15	16	3538
Total Reduction in Runoff by Disconnecting Roofs (Cu. Ft,)	121	86	81	70	86	72	79	82	78	58	62	49	3275
Total Reduction in Runoff by Disconnecting Roofs (Gal.)	910	640	610	520	640	540	590	610	580	430	460	370	24500
Percent Reduction in Runoff by Disconnecting Roofs	86%	78%	69%	83%	82%	77%	56%	73%	50%	78%	81%	75%	48%
Average Reduction						7	74%			•			See Note 1
	•		Soil Ty	pe C									•
Undeveloped (Desert, Fair) (Cu. Ft,)	0	0	0	0	0	0	0	0	0	0	0	0	0
Developed (Weighted Curve Number) (Cu. Ft,)	67	53	73	33	57	27	66	47	59	35	32	27	4756
Roofs Connected (Weighted Average Volume) (Cu. Ft,)	141	110	117	84	106	94	140	113	156	74	77	65	6850
Roofs Disconnected (Two-Step Runoff Method) (Cu. Ft,)	30	32	48	20	31	24	67	37	79	23	19	20	4002
Total Reduction in Runoff by Disconnecting Roofs (Cu. Ft,)	111	78	69	64	75	70	73	76	77	51	58	45	2848
Total Reduction in Runoff by Disconnecting Roofs (Gal.)	830	580	520	480	560	520	550	570	580	380	430	340	21300
Percent Reduction in Runoff by Disconnecting Roofs	79%	71%	59%	76%	71%	74%	52%	67%	49%	69%	75%	69%	42%
Average Reduction						e	58%						See Note 1
Soil Type D									•				
Undeveloped (Desert, Fair) (Cu. Ft,)	6	6	5	5	5	8	6	6	7	3	4	3	348
Developed (Weighted Curve Number) (Cu. Ft,)	67	53	73	33	57	27	66	47	59	35	32	27	4756
Roofs Connected (Weighted Average Volume) (Cu. Ft,)	141	113	120	87	109	97	141	114	156	75	78	66	7189
Roofs Disconnected (Two-Step Runoff Method) (Cu. Ft,)	43	47	63	32	47	35	79	49	88	31	29	27	4839
Total Reduction in Runoff by Disconnecting Roofs (Cu. Ft,)	98	66	57	55	62	62	62	65	68	44	49	39	2350
Total Reduction in Runoff by Disconnecting Roofs (Gal.)	730	490	430	410	460	460	460	490	510	330	370	290	17580
Percent Reduction in Runoff by Disconnecting Roofs	70%	58%	48%	63%	57%	64%	44%	57%	44%	59%	63%	59%	33%
Average Reduction			•			[57%	•	•	•		•	See Note 1
Notes:													

1. Site 13 was the only townhome site analyzed, therefore there is insufficient data to make solid recommendations for similar developments. Such developments should have a site-specific analysis performed to determine the estimated reduction runoff by disconnecting roofs.

Based on the results shown in Table 2 above, a number of observations can be made:

- The average total percent impervious across all sites is 56-percent, with values ranging from 34% to 64%. The typical residential development curve numbers in Table 2-2a of TR-55 assume a total percent impervious of 38% for 1/4-acre residential development and 65% for 1/8 acre or less residential developments. This reinforces the fact that engineers should exercise caution when using curve numbers for urban areas directly from Table 2-2a.
- For all soil types and all sites, there is a large difference in runoff volume predicted by the weighted average curve number and the weighted average volume methods. The weighted average volume method is about 200% of the weighted average curve number method for all sites except for the townhome subdivision, where the difference is about 150%.
- For all sites and soil types, there is a minimum 55% average reduction in estimated runoff when roofs are disconnected from downstream impervious areas.
- For soil types A and B at all sites (except site 13) when roofs are disconnected, the remaining downstream pervious area can absorb all the rainfall falling on the pervious area as well as all runoff from the rooftop. The only runoff from these sites is the runoff from rain fall on the remaining directly connected impervious areas (driveways and public sidewalks).

RECOMMENDATIONS

The DWQ low impact development (LID) guidance document (DWQ 2018) mentions the practice of disconnecting impervious areas as a recommended LID site design practice; however, no details are provided for quantifying the potential runoff reduction of the practice. The designer can use a site-specific analysis or approximate method as described in the following sections to refine post-development runoff volume estimates to account for disconnecting roofs from downstream impervious areas.

The reader should note that reducing runoff from a site by disconnecting rooftop drains as described in this TM will increase the amount of infiltration, retention, and evapotranspiration on a site. This TM provides guidelines and recommendations for determining the magnitude of this increase in infiltration. The potential geotechnical concerns which may arise from increasing retention and infiltration in the vicinity of structures is beyond the scope of this study. In evaluating the implementation of disconnected impervious areas as described herein, engineers, developers, and reviewers should exercise caution and consider all potential impacts of increased infiltration on a proposed site.

Site-Specific Analysis

A site-specific analysis can be conducted as follows:

- 1. <u>Identify the 80th percentile rainfall depth</u>
- 2. <u>Determine the hydrologic soil type for the site</u> Sites with more than one soil type were not addressed in this TM but similar methods can be used to develop composite CN values for site pervious areas.
- 3. <u>Determine undeveloped runoff volume</u> Calculate the estimated runoff for the site in the undeveloped condition using a weighted average for the undeveloped land cover. (Typically desert in Washington County)
- 4. <u>Determine developed land cover areas</u> –For the developed condition, delineate and measure the areas of land cover types present within a site, including but not limited to: directly connected impervious areas (driveways and public sidewalks), unconnected impervious

areas (detached sheds and private sidewalks/concrete pads), roofs and lawns, and other pervious areas (planters, gravel with pervious weed barrier).

- 5. <u>Determine developed runoff volume with roofs connected</u> Use the weighted average volume method. Include the area of building rooftops in the value for DCIA. (See Example 5-2 of the NJ SWMP)
- 6. <u>Determine developed runoff with roofs disconnected</u> Use the two-step runoff method (See NJ SWBMP Example 5-3)
 - a. Calculate the runoff from building rooftops (using a CN of 98), then convert that volume to an equivalent rainfall depth over the area of the downstream unconnected pervious areas using the equations below:

$$P_{roofs} = \frac{V_{roofs}}{A_{per}} x \ 12$$

Where:

*V*_{roofs} = *Volume of runoff from roofs, cubic feet*

- A_{per} = Area of downstream, unconnected pervious areas where roof drains will discharge, square feet
- P_{roofs} = Runoff from roofs as additional precipitation depth to be applied on downstream pervious areas, inches

<u>And:</u>

$$P_{eqv} = P_{80} + P_{roofs}$$

<u>Where:</u>

 $\overline{P_{80}}$ = Precipitation depth of 80th percentile storm (0.44 inches in Washington County)

 P_{eqv} = Total equivalent precipitation depth to be applied on downstream pervious areas, inches

- b. Calculate the estimated runoff from the remaining pervious and connected impervious areas, using the weighted average volume method. For pervious areas, use the total equivalent precipitation depth (P_{eqv}) as calculated in 6a above. For remaining impervious areas, use the 80th percentile rainfall depth (P_{80}).
- 7. <u>Determine volume reduction obtained by disconnecting roofs</u> Subtract the result of 6 from 5 above.
- 8. <u>Compare undeveloped and developed runoff volumes</u> Subtract the result of 6 from 3 above. If the resulting difference in volume is greater than zero, additional BMPs can be implemented as feasible to further reduce post-development runoff volume to the maximum extent practical (MEP) as required by the general MS4 permit.

Approximate Method

Based on the results of the analysis conducted for sites 1 through 12, approximate reduction factors were selected to quickly approximate the runoff volume reduction achievable by disconnecting rooftops from downstream impervious areas. An approximate method analysis is conducted in the same manner as the site-specific analysis outlined above, however, the developed runoff volume with roofs disconnected (Step 6) can be approximated as follows:

6. <u>Determine developed runoff volume with roofs disconnected</u> – For a given site soil type, multiply the calculated volume by the appropriate factor from Table 3 below to obtain the runoff volume for the site when roofs are disconnected:

Table 3Factors for Converting Runoff Volumes from Sites with Roofs Connected to
Roofs Disconnected Condition

Soil Type	Reduction Factor ¹
A or B	0.35
С	0.45
D	0.55

Notes:

1. Reduction factor is the average ratio of disconnected to connected runoff with an additional factor for the uncertainty of site-specific conditions

This simplified method should be used only if the subject site meets the following conditions:

- The site is a single residential lot with land covers similar in type and proportion to the sites used in this study (see Attachment B for details).
- Total percent impervious is less than 65%.
- Pervious areas must include at least 20% lawn in good condition.

Additional Limitations

For any impervious area to be considered unconnected, the following conditions must be met:

- 1. All runoff from the unconnected impervious area must be sheet flow.
- 2. Upon entering the downstream pervious area, all runoff must remain as sheet flow.
- 3. Flow from the impervious surface must enter the downstream pervious area as sheet flow or, in the case of roofs, from downspouts equipped with splash pads, level spreaders, or dispersion trenches that reduce flow velocity and induce sheet flow in the downstream pervious area.
- 4. All discharges onto the downstream pervious surfaces must be stable and nonerosive.
- 5. The shape, slope, and vegetated cover in the downstream pervious area must be sufficient to maintain sheet flow throughout its length. Maximum slope of the downstream pervious area is 8 percent.
- 6. The maximum roof area that can be drained by a single downspout is 600 square feet.

In addition, downstream unconnected pervious areas must meet the following conditions:

- 1. The minimum sheet flow length across the downstream pervious area is 25 feet.
- 2. The maximum sheet flow length across the unconnected impervious area is 100 feet.
- 3. While the total flow length area may be greater, the maximum sheet flow length across the downstream pervious area that can be used to compute the total resultant runoff volume is 150 feet.

CONCLUSIONS

Based on the analysis of the residential sites selected for this study, the practice of disconnecting rooftops from downstream impervious areas can be used to reduce the runoff volume from the site by 55 to 74% on average, depending on the soil type. Using a combination of the weighted average volume and two-step runoff volume methods described in this TM, site designers and reviewers can quantify the estimated reduction in runoff volume achieved by disconnecting impervious areas for

almost any site. When implementing this practice, designers and reviewers must ensure the proposed design meets the limitations for unconnected impervious and downstream unconnected pervious areas described in this TM.

REFERENCES

Natural Resources Conservation Service, National Engineering Handbook, Part 630, Hydrology.

- New Jersey Department of Environmental Protection, April 2004, New Jersey Stormwater Best Management Practices Manual (<u>https://www.njstormwater.org/bmp_manual2.htm</u>).
- U.S. Department of Agriculture, Soil Conservation Service, June 1986, Urban Hydrology for Small Watersheds, Technical Release 55.
- Utah Department of Environmental Quality, Division of Water Quality, December 2018, A Guide to Low Impact Development within Utah.
- Utah Department of Environmental Quality, Division of Water Quality, February 2020, General Permit for Discharges from Small Municipal Separate Storm Sewer Systems (MS4s), UPDES Permit Number UTR09000.

Attachment A – Excerpts from Chapter 5 of New Jersey Storm Water Best Management Practices Manual (2004)

Example 5-2: Site With Pervious and Directly Connected Impervious Cover Runoff Volume Computation Using NRCS Methodology

Description: A 3-acre development site is comprised of 1 acre of impervious surface and 2 acres of lawn and woods with an NRCS Curve Number (CN) of 65. The entire impervious surface is directly connected to the site's drainage system. Compute the site's total runoff volume for the 1.25-inch stormwater quality design storm using the Weighted Average CN technique. Compare the results with the Weighted Average Volume technique.

Stormwater Quality Design Storm = P = 1.25 inches Total drainage area = 3 acres Impervious area = 1 acre (1/3 of total area) Pervious area = 2 acres (2/3 of total area) Pervious cover = mixture of lawn and woods Pervious CN = 65 Impervious cover = asphalt Impervious CN = 98

Note: All impervious cover is connected to the drainage system



1. Using Weighted Average Curve Number Technique

Weighted CN = (65)(2/3) + (98)(1/3) = 76

Average S =
$$\frac{1000}{CN}$$
 - 10 = $\frac{1000}{76}$ - 10 = 3.16 inches

Average initial abstraction = Ia = 0.2S = (0.2)(3.16) = 0.63 inches

0.8S = (0.8)(3.16) = 2.53 inches

Runoff volume = Q = $\frac{(P - 0.2 \text{ S})^2}{P + 0.8 \text{ S}} = \frac{(1.25 - 0.63)^2}{1.25 + 2.53} = 0.10$ inches

Runoff volume = (0.10 inches/12 inches per foot)(3 acres)(43,560 sf per acre)

Total site runoff volume = 1089 cubic feet

2. Using Weighted Average Volume Technique

Impervious Area

Impervious area S =
$$\frac{1000}{CN}$$
 - 10 = $\frac{1000}{98}$ - 10 = 0.20 inches

Impervious area initial abstraction = 0.2S = (0.2)(0.20) = 0.04 inches

0.8S = (0.8)(0.20) = 0.16 inches

Impervious area runoff volume = Q = $\frac{(P - 0.2 \text{ S})^2}{P + 0.8 \text{ S}} = \frac{(1.25 - 0.04)^2}{1.25 + 0.16} = 1.04$ inches

Runoff volume = (1.04 inches/12 inches per foot)(1 acre)(43,560 sf per acre)

Impervious area runoff volume = 3775 cubic feet

Pervious Area

Pervious area S = $\frac{1000}{CN}$ - 10 = $\frac{1000}{65}$ - 10 = 5.38 inches

Pervious area initial abstraction = 0.2S = (0.2)(5.38) = 1.08 inches

0.8S = (0.8)(5.38) = 4.30 inches

Pervious area runoff volume = Q = $\frac{(P - 0.2 \text{ S})^2}{P + 0.8 \text{ S}} = \frac{(1.25 - 1.08)^2}{1.25 + 4.30^2} = 0.005$ inches

Runoff volume = (0.005 inches/12 inches per foot)(2 acres)(43,560 sf per acre)

Pervious area runoff volume = 36 cubic feet

Total site runoff volume = 3775 + 36 = 3811 cubic feet (vs. 1089 cubic feet using weighted average CN)

As can be seen in Example 5-2 above, the weighted average CN technique produced an estimated stormwater quality design storm runoff volume that was less than 30 percent of the volume produced by the weighted average volume technique. Perhaps more significantly, the example also demonstrates how virtually the entire site runoff for the stormwater quality design storm comes from the impervious portion and that very little comes from the pervious portion (i.e., 3775 cubic feet vs. 36 cubic feet). The significant but erroneous initial loss that the NRCS cautions about in TR-55 can also be seen in the 0.63 inch initial abstraction for the entire site (including 1 acre of impervious surface) produced by the weighted average CN technique.

It is important to note that, in computing a weighted average runoff volume from the development site, Example 5-2 does not address the resultant peak discharge or hydrograph from the site. If both the pervious and directly connected impervious site areas will have the same time of concentration, the weighted runoff volume can then be used directly to compute the peak site discharge or hydrograph. However, if these areas will respond to rainfall with different times of concentration, separate hydrographs should be computed for each and then combined to produce the peak site discharge or hydrograph.

their own direct rainfall as well as the "rainfall" flowing from the upstream unconnected impervious areas. The resultant runoff from the downstream pervious areas in response to this combined rainfall can then be computed using the NRCS runoff equation again.

Example 5-3 illustrates this two-step runoff computation technique for unconnected impervious areas. In reviewing the example, it is important to note that the unconnected impervious area runoff depth must be converted to an equivalent uniform rainfall depth over the entire downstream pervious area based on the relative sizes of the unconnected impervious and downstream pervious areas.

Example 5-3: Site With Unconnected Impervious Cover Runoff Volume Computation Using Two-Step Technique

Description: A 3-acre development site is comprised of 1 acre of impervious surface and 2 acres of lawn and woods with an NRCS Curve Number (CN) of 65. Runoff from the entire impervious surface sheet flows onto to the pervious portion of the site before entering the site's drainage system. Compute the total runoff volume for the 1.25-inch stormwater quality design storm using the NRCS methodology.

Stormwater Quality Design Storm = P = 1.25 inches Total drainage area = 3 acres

Impervious area = 1 acre (1/3 of total area) Pervious area = 2 acres (2/3 of total area)

Pervious cover = mixture of lawn and woods pervious CN = 65 Impervious cover = asphalt impervious CN = 98

Note: All impervious area runoff sheet flows onto downstream pervious area



Equivalent rainfall depth on downstream pervious area =

(3775 cubic feet)/(2 acres)(43,560 sf per acre) = 0.043 feet = 0.52 inches

Pervious Area

Total effective rainfall = direct rainfall + unconnected impervious area runoff

= 1.25 inches + 0.52 inches = 1.77 inches total Pervious area S = $\frac{1000}{CN}$ - 10 = $\frac{1000}{65}$ - 10 = 5.38 inches

Pervious area initial abstraction = 0.2S = (0.2)(5.38) = 1.08 inches

0.8S = (0.8)(5.38) = 4.30 inches

Pervious area runoff volume = Q = $\frac{(P - 0.2 \text{ S})^2}{P + 0.8 \text{ S}} = \frac{(1.77 - 1.08)^2}{1.77 + 4.30} = 0.08$ inches

Runoff volume = (0.08 inches/12 inches per foot)(2 acres)(43,560 sf per acre) = 581 cubic feet

Pervious area runoff volume = total runoff volume = 581 cubic feet

From the above example, it can be seen that a key parameter in the two-step runoff computation technique for unconnected impervious cover is the effective size of the downstream pervious area. The following three criteria, in conjunction with the seven requirements for all unconnected impervious areas shown above, should be used to determine the effective size of this downstream area:

- 1. The minimum sheet flow length across the downstream pervious area is 25 feet.
- 2. The maximum sheet flow length across the unconnected impervious area is 100 feet.
- 3. While the total flow length area may be greater, the maximum sheet flow length across the downstream pervious area that can be used to compute the total resultant runoff volume is 150 feet.

These criteria are illustrated below in Figures 5-5 and 5-6 for both on-grade and above-grade unconnected impervious areas, respectively. Additional criteria for determining the lower limits of the downstream pervious area are presented in Figure 5-7. When using Figure 5-6 with overlapping pervious areas downstream of roof downspouts, the overlapping areas should be counted only once in the computation of the total pervious area downstream of the roof.

Finally, when computing the peak runoff rate or hydrograph from an area with unconnected impervious cover, the time of concentration of the combined impervious and downstream pervious area should be based upon the Tc of the downstream pervious area only, with the Tc route beginning as sheet flow at the upper end of the pervious area.

Attachment B - Runoff Volume Calculations

Example Number	1
Zoning Type	Residential 1/4 Acre
Zoning ID	R-1-10

80th Percentile Storm Depth	0.4	<mark>4</mark> in		
Total Area			0004	
Roof	0.22	9 acres 9 acres	5187	sq ft
Driveway/sidewalk	0.02	1 acres	928	sq ft
Other Impervious	0.00	7 acres	288	sq ft
Lawn	0.04	6 acres	2021	sq ft
Other Pervious	0.03	6 acres	1556	sq ft

Impervious Areas								
Total Imponious Area	0.147	acres	6404	sq ft				
Total Impervious Area	64%							
Directly Connected Impervious Areas								
w/ Roof connected	0.140	acres	6116	sq ft				
w/ Roof disconnected	0.021	acres	928	sq ft				
Unconnnected Impervious Areas								
w/ Roof connected	0.007	acres	288	sq ft				
w/ Roof disconnected	0.126	acres	5476	sq ft				

Curve numbers						
Soil Type	A	В	С	D		
Undeveloped (Desert, Fair)	55	72	81	86		
Natural Desert Landscaping	63	77	85	88		
Lawn	39	61	74	80		
Impervious Areas	98	98	98	98		
Composite Pervious Numbers for this lot	49	68	79	83		

Variable Abbreviations					
A _{imp} Impervious Area, acres					
A _{per}	Pervious Area, acres				
P _{imp}	Percent Impervious, %				
CN _p	Pervious Area Curve Number				
CN _c	Composite Curve Number				
S	Maxiumum Potential Retention, inches				
la	Initial Abstraction, inches				



				١	Volume N	EH 630/TR-	55 Metho	bd						
Scenario D	escription	A _{imp}	A _{per}	P _{imp}	R	CN _p	CN _c	S	la		Volume		Comments	
		(acres)	(acres)	(%)	(%)	-	-	(in)	(in)	(in)	(cu ft)	(gal)		
						Soil Type A								
Undeveloped	(Desert, Fair)			0	0	55	55	8.18	1.64	0.000	0	0		
Developed (Composite C	urve Number Approach)	0.147	0.082	64		83	93	0.75	0.15	0.080	67	500	Typical Method - Underestimates runoff for areas with directly conne	
	Pervious Area		0.082				49	10.41	2.08	0.000	0	0		
Roof Connected - Weighted Average Volume Impervious Area 0.147					98	0.20	0.04	0.264	141	1055	Calculates runoff from impervious area and pervious areas separatel			
	Weighted Volume Total									0.264	141	1055		
	Runoff from Disconnected Imp Area	0.126					98	0.20	0.04	0.264	121	902		
	Equiv. Rain on Downstream Pervious Area (in) 0.4	0												
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.8	4											Calculates runoff from roof, then applies that runoff as "rainfall" to t	
· · · · · · · · · · · · · · · · · · ·	Downstream Pervious Area Runoff		0.082				49	10.41	2.08	0.000	0	0		
	Downstream Impervious Area Runoff	0.021					98	0.20	0.04	0.264	20	153		
	Weighted Volume Total										20	153		
Reduction in Runoff obtain	ned by disconnecting Roof										121	902		
						Soil Type B								
Undeveloped	(Desert, Fair)			0	0	72	72	3.89	0.78	0.000	0	0		
Developed (Composite C	urve Number Approach)	0.147	0.082	64	•	83	93	0.75	0.15	0.080	67	500	Typical Method - Underestimates runoff for areas with directly conne	
	Pervious Area		0.082				68	4.71	0.94	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.147					98	0.20	0.04	0.264	141	1055	Calculates runoff from impervious area and pervious areas separate	
	Weighted Volume Total									0.264	141	1055		
	Runoff from Disconnected Imp Area	0.126					98	0.20	0.04	0.264	121	902		
	Equiv. Rain on Downstream Pervious Area (in) 0.4	0												
Deef Disconnected Two Stee Dweeff Mathed	New Total Effective Rainfall Depth (in) 0.8	4												
Roof Disconnected - Two-step Runon Method	Downstream Pervious Area Runoff		0.082				68	4.71	0.94	0.000	0	0	calculates runon from root, then applies that runon as rainfail to t	
	Downstream Impervious Area Runoff	0.021					98	0.20	0.04	0.264	20	153		
	Weighted Volume Total										20	153		
Reduction in Runoff obtain	ned by disconnecting Roof										121	902		
						Soil Type C								
Undeveloped	(Desert, Fair)			0	0 0	81	81	2.35	0.47	0.000	0	0		
Developed (Composite C	urve Number Approach)	0.147	0.082	64	-	83	93	0.75	0.15	0.080	67	500	Typical Method - Underestimates runoff for areas with directly conne	
· · · · · · · · · · · · · · · · · ·	Pervious Area		0.082				79	2.66	0.53	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.147					98	0.20	0.04	0.264	141	1055	Calculates runoff from impervious area and pervious areas separately	
	Weighted Volume Total	0.117					50	0.20	0.01	0.264	141	1055	· · · · · · · · · · · · · · · · · · ·	
	Bunoff from Disconnected Imp Area	0.126					98	0.20	0.04	0.264	121	902		
	Equiv Bain on Downstream Pervious Area (in)	0					50	0.20	0.01	0.201		502		
	New Total Effective Rainfall Denth (in)	4	1					-						
Roof Disconnected - Two-Step Runoff Method	Downstream Penvious Area Bunoff		0.082				79	2.66	0.53	0.032	10	71	Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Impervious Area Bunoff	0.021	0.002				98	0.20	0.04	0.264	20	153		
			224											
Reduction in Runoff obtain	ned by disconnecting Roof										111	830		
						Soil Type D								
Lindeveloped	(Desert Fair)			0		86	86	1.63	0.33	0.008	6	47		
Developed (Composite C	(Desert, Fair)	0 147	0.082	64		83	93	0.75	0.55	0.000	67	500	Typical Method - Underestimates rupoff for areas with directly conne	
Severoped (composite e	Pervious Area	0.217	0.082				83	2.05	0.41	0.000	0	1		
Roof Connected - Weighted Average Volume	Impervious Area	0 147	0.002				98	0.20	0.41	0.264	141	1055	Calculates runoff from impervious area and pervious areas separately	
Noor connected Weighted Weidge Volume	Weighted Volume Total	0.147					58	0.20	0.04	0.204	141	1055		
	Runoff from Disconnected Imp Area	0.126					00	0.20	0.04	0.203	121	1030		
	Equiv Rain on Downstream Pervious Area (in)	0.126					98	0.20	0.04	0.204	121	902		
	New Total Effective Painfall Depth (in)	4	1											
Roof Disconnected - Two-Step Runoff Method	Downstream Penvious Area Runoff	4	0.002				01	2.05	0.41	0.075	22	107	Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Pervious Area Runoff	0.021	0.082		1		83	2.05	0.41	0.075	22	167		
	Moinstream Impervious Area KUNOT	0.021					98	0.20	0.04	0.264	20	153		
Deduction in Description	I weighted voidme Total										43	319		
Reduction in Runoff obtain	ieu by disconnecting Rooi										98	/36		



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Example Number	2
Zoning Type	Residential 1/4 Acre
Zoning ID	R-1-10

80th Percentile Storm Depth	0.44	in		
Total Area	0.235	acres	10255	sq ft
Roof	0.085	acres	3718	sq ft
Driveway/sidewalk	0.025	acres	1100	sq ft
Other Impervious	0.004	acres	170	sq ft
Lawn	0.030	acres	1289	sq ft
Other Pervious	0.091	acres	3978	sq ft

Impervious Areas										
Total Imponious Area	0.115	acres	4988	sq ft						
rotal impervious Area	49%									
Directly Connected Impervious Areas										
w/ Roof connected	0.111	acres	4818	sq ft						
w/ Roof disconnected	0.025	acres	1100	sq ft						
Unconnnected Impervious Areas										
w/ Roof connected	0.004	acres	170	sq ft						
w/ Roof disconnected	0.089	acres	3888	sq ft						

Curve numbers										
Soil Type	A	В	С	D						
Undeveloped (Desert, Fair)	55	72	81	86						
Natural Desert Landscaping	63	77	85	88						
Lawn	39	61	74	80						
Impervious Areas	98	98	98	98						
Composite Pervious Numbers for this lot	57	73	82	86						

	Variable Abbreviations						
A _{imp}	Impervious Area, acres						
A _{per}	Pervious Area, acres						
P _{imp}	Percent Impervious, %						
CN _p	Pervious Area Curve Number						
CN _c	Composite Curve Number						
S	Maxiumum Potential Retention, inches						
la	Initial Abstraction, inches						



					olume N	FH 630/ТР	-55 Mathor	4					
									le.		Volume		
Scenario Description		A _{imp}	A _{per}	P _{imp} (%)	R (%)	CN _p	CN _c	5 (in)	la (in)	(in)	voiume (cu.ft)	(gal)	Comments
		(00/05)	(ucres)	(70)	(70)	Soil Type A		(11)	(11)	("")	(60 10)	(641)	
lindeveloped (I	Desert, Fair)			0	(55 55	55	8,18	1.64	0.000	0	0	
Developed (Composite Cu	rve Number Approach)	0.115	0,121	49		86	92	0.87	0,17	0.062	53	399	Typical Method - Underestimates runoff for areas with directly conne
	Pervious Area	0.115	0.121	15			57	7.54	1.51	0.000	0	0	Typical method - onderestimates ranon for areas with an early conne
Roof Connected - Weighted Average Volume	Impervious Area	0.115	-				98	0.20	0.04	0.264	110	821	Calculates runoff from impervious area and pervious areas separately
	Weighted Volume Total									0.264	110	821	
	Runoff from Disconnected Imp Area	0.089					98	0.20	0.04	0.264	86	640	
	Equiv. Rain on Downstream Pervious Area (in) 0.20												
Dest Discounted Tax Class Dass (Charles I	New Total Effective Rainfall Depth (in) 0.64												enter la constitución de
Roof Disconnected - Two-Step Runoff Method	Downstream Pervious Area Runoff		0.121				57	7.54	1.51	0.000	0	0	Calculates runoff from roof, then applies that runoff as "rainfall" to th
	Downstream Impervious Area Runoff	0.025					98	0.20	0.04	0.264	24	181	
	Weighted Volume Total										24	181	
Reduction in Runoff obtaine	ed by disconnecting Roof										86	640	
						Soil Type B							
Undeveloped (Desert. Fair)			0	C	72	72	3.89	0.78	0.000	0	0	
Developed (Composite Cu	rve Number Approach)	0.115	0.121	49		86	92	0.87	0.17	0.062	53	399	Typical Method - Underestimates runoff for areas with directly conne
	Pervious Area		0.121				73	3.70	0.74	0.000	0	0	
Roof Connected - Weighted Average Volume	Impervious Area	0.115					98	0.20	0.04	0.264	110	821	Calculates runoff from impervious area and pervious areas separately
	Weighted Volume Total									0.264	110	821	
	Runoff from Disconnected Imp Area	0.089					98	0.20	0.04	0.264	86	640	
Roof Disconnected - Two-Step Runoff Method	Equiv. Rain on Downstream Pervious Area (in) 0.20												
	New Total Effective Rainfall Depth (in) 0.64												Colordates are off from and then evaluate that are off on "saidfall" to the
	Downstream Pervious Area Runoff		0.121				73	3.70	0.74	0.000	0	0	Calculates runoff from root, then applies that runoff as "rainfall" to ti
	Downstream Impervious Area Runoff	0.025					98	0.20	0.04	0.264	24	181	
	Weighted Volume Total										24	181	
Reduction in Runoff obtaine	ed by disconnecting Roof										86	640	
						Soil Type C							
Undeveloped (I	Desert, Fair)			0	C	81	81	2.35	0.47	0.000	0	0	
Developed (Composite Cu	rve Number Approach)	0.115	0.121	49		86	92	0.87	0.17	0.062	53	399	Typical Method - Underestimates runoff for areas with directly conne
	Pervious Area		0.121				82	2.20	0.44	0.000	0	0	
Roof Connected - Weighted Average Volume	Impervious Area	0.115					98	0.20	0.04	0.264	110	821	Calculates runoff from impervious area and pervious areas separately
	Weighted Volume Total									0.264	110	821	
	Runoff from Disconnected Imp Area	0.089					98	0.20	0.04	0.264	86	640	
	Equiv. Rain on Downstream Pervious Area (in) 0.20												
Poof Disconnected Two Ston Runoff Mathed	New Total Effective Rainfall Depth (in) 0.64												
Kool Disconnected - Two-step Kunon Method	Downstream Pervious Area Runoff		0.121				82	2.20	0.44	0.017	7	55	calculates runon from root, then applies that runon as rainfail to tr
	Downstream Impervious Area Runoff	0.025					98	0.20	0.04	0.264	24	181	
	Weighted Volume Total										32	236	
Reduction in Runoff obtaine	ed by disconnecting Roof										78	585	
						Soil Type D							
Undeveloped (I	Desert, Fair)			0	C	86	86	1.63	0.33	0.008	6	48	
Developed (Composite Cu	rve Number Approach)	0.115	0.121	49		86	92	0.87	0.17	0.062	53	399	Typical Method - Underestimates runoff for areas with directly conne
Roof Connected - Weighted Average Volume	Pervious Area		0.121				86	1.63	0.33	0.008	3	25	
	Impervious Area	0.115					98	0.20	0.04	0.264	110	821	Calculates runoff from impervious area and pervious areas separately
	Weighted Volume Total									0.272	113	846	
	Runoff from Disconnected Imp Area	0.089					98	0.20	0.04	0.264	86	640	
	Equiv. Rain on Downstream Pervious Area (in) 0.20												
Roof Disconnected - Two-Sten Runoff Method	New Total Effective Rainfall Depth (in) 0.64												Calculates runoff from roof, then applies that runoff as "rainfall" to the
Noor Disconnected - Two-step Runon Wethod	Downstream Pervious Area Runoff		0.121				86	1.63	0.33	0.051	22	167	calculates runon from root, then applies that runoif as "rainfall" to th
	Downstream Impervious Area Runoff	0.025					98	0.20	0.04	0.264	24	181	
	Weighted Volume Total										47	348	
Reduction in Runoff obtaine	ed by disconnecting Roof										67	498	



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Example Number	3
Zoning Type	Residential 1/4 Acre
Zoning ID	R-1-10

80th Percentile Storm Depth	0.44	in		
Total Area	0.195	acres	8486	sq ft
Roof	0.083	acres	3624	sq ft
Driveway/sidewalk	0.037	acres	1613	sq ft
Other Impervious	0.002	acres	71	sq ft
Lawn	0.013	acres	563	sq ft
Other Pervious	0.060	acres	2615	sq ft

Impervious Areas										
Total Importious Area	0.122	acres	5308	sq ft						
Total Impervious Area	63%									
Directly Connected Impervious Areas										
w/ Roof connected	0.120	acres	5237	sq ft						
w/ Roof disconnected	0.037	acres	1613	sq ft						
Unconnnected Impervious Areas										
w/ Roof connected	0.002	acres	71	sq ft						
w/ Roof disconnected	0.085	acres	3695	sq ft						

Curve numbers										
Soil Type	A	В	С	D						
Undeveloped (Desert, Fair)	55	72	81	86						
Natural Desert Landscaping	63	77	85	88						
Lawn	39	61	74	80						
Impervious Areas	98	98	98	98						
Composite Pervious Numbers for this lot	59	74	83	87						

	Variable Abbreviations						
A _{imp}	Impervious Area, acres						
A _{per}	Pervious Area, acres						
P _{imp}	Percent Impervious, %						
CN _p	Pervious Area Curve Number						
CN _c	Composite Curve Number						
S	Maxiumum Potential Retention, inches						
la	Initial Abstraction, inches						



				V	olume N	EH 630/TR-	55 Metho	bd						
Scenario D	scription	Aimp	Aper	P _{imp}	R	CN _p	CN _c	S	la		Volume		Comments	
Scenario De	scription	(acres)	(acres)	(%)	(%)	-	-	(in)	(in)	(in)	(cu ft)	(gal)	comments	
				<u> </u>		Soil Type A								
Undeveloped	Desert, Fair)			0	0	55	55	8.18	1.64	0.000	0	0		
Developed (Composite Cu	rve Number Approach)	0.122	0.073	63		87	94	0.64	0.13	0.103	73	543	Typical Method - Underestimates runoff for areas with directly conne	
	Pervious Area		0.073				59	6.95	1.39	0.000	0	0	C.I. I.I	
Roof Connected - weighted Average Volume	Impervious Area	0.122					98	0.20	0.04	0.264	117	874	Calculates runoff from impervious area and pervious areas separatel	
	Weighted Volume Total									0.264	117	874		
	Runoff from Disconnected Imp Area	0.085					98	0.20	0.04	0.264	81	609		
	Equiv. Rain on Downstream Pervious Area (in) 0.3													
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.7		0.072				50	6.05	4.20	0.000	0		Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Pervious Area Runoff	0.027	0.073				59	6.95	1.39	0.000	0	0		
	Downstream impervious Area Runon	0.037					98	0.20	0.04	0.264	35	266		
Reduction in Runoff obtain	weighted volume rotal					+					35	200		
Reduction in Runoil obtain						Coll Turne D					18	609		
the state of the s	Descal Feld		1 1			Soli Type B	72	2.00	0.70	0.000				
Undeveloped I	Desert, Fair)	0.122	0.072	0	ι	72	/2	3.89	0.78	0.000	0	542	Tuning Mathed Hadevestimates an off for every with directly one	
Developed (composite ct	Pervious Area	0.122	0.073	03		87	94	0.64	0.13	0.103	/3	543	Typical Method - Onderestimates runon for areas with directly conne	
Roof Connected - Weighted Average Volume		0.122	0.073			1	/4	3.51	0.70	0.000	117	974	Calculates runoff from impervious area and pervious areas separatel	
Noor connected - weighted Average volume	Weighted Volume Total	0.122				1	30	0.20	0.04	0.264	117	074 974		
	Runoff from Disconnected Imp Area	0.095					0.0	0.20	0.04	0.264	01	674		
	Fourier Rain on Downstream Penvious Area (in)	0.085					30	0.20	0.04	0.204	10	009		
Roof Disconnected - Two-Step Runoff Method	Equiv. Rain on Downstream Pervious Area (iii) 0.5	-				1								
	Downstream Penvious Area Runoff		0.073				74	3 51	0.70	0.001	0	1	Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Impervious Area Runoff	0.037	0.073				98	0.20	0.70	0.001	35	266		
	Weighted Volume Total	0.037					58	0.20	0.04	0.204	36	200		
Reduction in Runoff obtain	ad by disconnecting Boof										30 81	607		
Actual of an Autor obtain			1			Soil Type C		I. I.			01	007		
Lindeveloped	Desert Eair)		1	0	(91	91	2 25	0.47	0.000	0	0		
Developed (Composite C	nve Number Approach)	0 1 2 2	0.073	63		87	94	0.64	0.47	0.000	73	543	Typical Method - Underestimates runoff for areas with directly conn	
	Pervious Area	0.122	0.073	00		0,7	83	2.05	0.13	0.000	0	1		
Roof Connected - Weighted Average Volume	Impervious Area	0 1 2 2	0.075				98	0.20	0.04	0.264	117	874	Calculates runoff from impervious area and pervious areas separatel	
	Weighted Volume Total	0.122						0.20	0.01	0.265	117	875	·····	
	Runoff from Disconnected Imp Area	0.085					98	0.20	0.04	0.265	81	609		
	Equiv. Bain on Downstream. Pervious Area (in) 0.3	0.005						0.20	0.01	0.201	01	005		
	New Total Effective Bainfall Depth (in) 0.7													
Roof Disconnected - Two-Step Runoff Method	Downstream Pervious Area Runoff		0.073				83	2.05	0.41	0.049	13	96	Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Impervious Area Runoff	0.037					98	0.20	0.04	0.264	35	266		
	Weighted Volume Total										48	362		
Reduction in Runoff obtain	ed by disconnecting Roof					1		1			69	513		
						Soil Type D								
Undeveloped	Desert, Fair)			0	C	86	86	1.63	0.33	0.008	5	40		
Developed (Composite Cu	rve Number Approach)	0.122	0.073	63		87	94	0,64	0.13	0.103	73	543	Typical Method - Underestimates runoff for areas with directly conn	
	Pervious Area		0.073				87	1.49	0.30	0.012	3	24	rest include onderestinates randin for a cas with directly com	
Roof Connected - Weighted Average Volume	Impervious Area	0.122					98	0.20	0.04	0.264	117	874	alculates runoff from impervious area and pervious areas separately	
	Weighted Volume Total									0.276	120	898		
	Runoff from Disconnected Imp Area	0.085					98	0.20	0.04	0.264	81	609		
	Equiv. Rain on Downstream Pervious Area (in) 0.3													
Poof Disconnected Two Star Duraff Mathed	New Total Effective Rainfall Depth (in) 0.7	5												
Roof Disconnected - Two-Step Runoff Method	Downstream Pervious Area Runoff		0.073				87	1.49	0.30	0.105	28	207	calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Impervious Area Runoff	0.037					98	0.20	0.04	0.264	35	266		
	Weighted Volume Total										63	473		



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Example Number	4
Zoning Type	Residential 1/4 Acre
Zoning ID	R-1-10

80th Percentile Storm Depth	0.44	in		
Total Area	0.193	acres	8394	sq ft
Roof	0.069	acres	3027	sq ft
Driveway/sidewalk	0.015	acres	638	sq ft
Other Impervious	0.004	acres	170	sq ft
Lawn	0.027	acres	1166	sq ft
Other Pervious	0.078	acres	3393	sq ft

Impervious Areas								
Total Impervious Area	0.088	acres	3834	sq ft				
	46%							
Directly Connected Impervious Areas								
w/ Roof connected	0.084	acres	3664	sq ft				
w/ Roof disconnected	0.015	acres	638	sq ft				
Unconnnected Impervious Areas								
w/ Roof connected	0.004	acres	170	sq ft				
w/ Roof disconnected	0.073	acres	3197	sq ft				

Curve numbers							
Soil Type	A	В	С	D			
Undeveloped (Desert, Fair)	55	72	81	86			
Natural Desert Landscaping	63	77	85	88			
Lawn	39	61	74	80			
Impervious Areas	98	98	98	98			
Composite Pervious Numbers for this lot	57	73	82	86			

	Variable Abbreviations
A _{imp}	Impervious Area, acres
A _{per}	Pervious Area, acres
P _{imp}	Percent Impervious, %
CN _p	Pervious Area Curve Number
CN _c	Composite Curve Number
S	Maxiumum Potential Retention, inches
la	Initial Abstraction, inches



				,	Volume NI	EH 630/TR	-55 Method	ł						
Constant D		Aima	Anar	Pimn	R	CN _n	CN _c	S	la		Volume			
scenario D	escription	(acres)	(acres)	(%)	(%)	-	-	(in)	(in)	(in)	(cu ft)	(gal)	comments	
						Soil Type A								
Undeveloped	(Desert, Fair)			(0 0	55	55	8.18	1.64	0.000	0	0		
Developed (Composite Composite Compo	urve Number Approach)	0.088	0.105	46	5	86	91	0.99	0.20	0.048	33	249	Typical Method - Underestimates runoff for areas with directly conn	
	Pervious Area		0.105				57	7.54	1.51	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.088	8				98	0.20	0.04	0.264	84	631	Calculates runoff from impervious area and pervious areas separatel	
	Weighted Volume Total									0.264	84	631		
	Runoff from Disconnected Imp Area	0.073					98	0.20	0.04	0.264	70	526		
	Equiv. Rain on Downstream Pervious Area (in) 0.	19												
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.	53											Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Pervious Area Runoff		0.105				57	7.54	1.51	0.000	0	0	·····	
	Downstream Impervious Area Runoff	0.015	i				98	0.20	0.04	0.264	14	105		
	Weighted Volume Total										14	105		
Reduction in Runoff obtain	ed by disconnecting Roof										70	526		
					-	Soil Type B								
Undeveloped	(Desert, Fair)			(0 0	72	72	3.89	0.78	0.000	0	0		
Developed (Composite Composite	urve Number Approach)	0.088	0.105	46	5	86	91	0.99	0.20	0.048	33	249	Typical Method - Underestimates runoff for areas with directly conn	
	Pervious Area		0.105				73	3.70	0.74	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.088	8				98	0.20	0.04	0.264	84	631	Calculates runoff from impervious area and pervious areas separatel	
	Weighted Volume Total									0.264	84	631		
	Runoff from Disconnected Imp Area	0.073					98	0.20	0.04	0.264	70	526		
	Equiv. Rain on Downstream Pervious Area (in) 0.1	19												
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.	<mark>63</mark>											Calculates runoff from roof, then applies that runoff as "rainfall" to t	
<u>D</u>	Downstream Pervious Area Runoff		0.105				73	3.70	0.74	0.000	0	0		
	Downstream Impervious Area Runoff	0.015	5				98	0.20	0.04	0.264	14	105		
	Weighted Volume Total										14	105		
Reduction in Runoff obtain	ed by disconnecting Roof										70	526		
						Soil Type C								
Undeveloped	(Desert, Fair)			(0 0	81	81	2.35	0.47	0.000	0	0		
Developed (Composite C	urve Number Approach)	0.088	0.105	46	5	86	91	0.99	0.20	0.048	33	249	Typical Method - Underestimates runoff for areas with directly conn	
	Pervious Area		0.105				82	2.20	0.44	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.088	8				98	0.20	0.04	0.264	84	631	Calculates runoff from impervious area and pervious areas separatel	
	Weighted Volume Total									0.264	84	631		
	Runoff from Disconnected Imp Area	0.073					98	0.20	0.04	0.264	70	526		
	Equiv. Rain on Downstream Pervious Area (in) 0.	19												
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.	6 <mark>3</mark>											Calculates runoff from roof then applies that runoff as "rainfall" to t	
	Downstream Pervious Area Runoff		0.105				82	2.20	0.44	0.015	6	43		
	Downstream Impervious Area Runoff	0.015	5				98	0.20	0.04	0.264	14	105		
	Weighted Volume Total										20	148		
Reduction in Runoff obtain	ed by disconnecting Roof										65	483		
						Soil Type D								
Undeveloped	(Desert, Fair)			(0 0	86	86	1.63	0.33	0.008	5	39		
Developed (Composite Composite Compo	urve Number Approach)	0.088	0.105	46	5	86	91	0.99	0.20	0.048	33	249	Typical Method - Underestimates runoff for areas with directly conn	
	Pervious Area		0.105				86	1.63	0.33	0.008	3	21		
Roof Connected - Weighted Average Volume	nected - Weighted Average Volume Impervious Area 0.088 98 0.20		0.04	0.264	84	631	Calculates runoff from impervious area and pervious areas separatel							
	Weighted Volume Total									0.272	87	653		
	Runoff from Disconnected Imp Area	0.073					98	0.20	0.04	0.264	70	526		
	Equiv. Rain on Downstream Pervious Area (in) 0.	19												
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.	53											Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Pervious Area Runoff		0.105				86	1.63	0.33	0.048	18	136		
	Downstream Impervious Area Runoff	0.015	5				98	0.20	0.04	0.264	14	105		
	Weighted Volume Total										32	241		
Reduction in Runoff obtain	ed by disconnecting Roof										55	411		



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Example Number	5
Zoning Type	Residential 1/4 Acre
Zoning ID	R-1-10

80th Percentile Storm Depth	0.44	in		
Total Area	0.195	acres	8474	sq ft
Roof	0.088	acres	3812	sq ft
Driveway/sidewalk	0.020	acres	855	sq ft
Other Impervious	0.003	acres	123	sq ft
Lawn	0.016	acres	684	sq ft
Other Pervious	0.069	acres	2999	sq ft

Impervious Areas								
Total Impervious Area	0.110	acres	4791	sq ft				
	57%							
Directly Connected Impervious Areas								
w/ Roof connected	0.107	acres	4667	sq ft				
w/ Roof disconnected	0.020	acres	855	sq ft				
Unconnnected Impervious Areas								
w/ Roof connected	0.003	acres	123	sq ft				
w/ Roof disconnected	0.090	acres	3935	sq ft				

Curve numbers							
Soil Type	A	В	С	D			
Undeveloped (Desert, Fair)	55	72	81	86			
Natural Desert Landscaping	63	77	85	88			
Lawn	39	61	74	80			
Impervious Areas	98	98	98	98			
Composite Pervious Numbers for this lot	59	74	83	87			

	Variable Abbreviations
A _{imp}	Impervious Area, acres
A _{per}	Pervious Area, acres
P _{imp}	Percent Impervious, %
CN _p	Pervious Area Curve Number
CN _c	Composite Curve Number
S	Maxiumum Potential Retention, inches
la	Initial Abstraction, inches



				١	/olume NE	H 630/TR	-55 Metho	od						
Comparia D		Aimo	Aner	Pimp	R	CN _p	CN _c	S	la		Volume		Commente	
Scenario De	escription	(acres)	(acres)	(%)	(%)	-	-	(in)	(in)	(in)	(cu ft)	(gal)	Comments	
						Soil Type A								
Undeveloped	(Desert, Fair)			0	0	55	55	8.18	1.64	0.000	0	0		
Developed (Composite Cu	irve Number Approach)	0.110	0.085	57		87	93	0.75	0.15	0.080	57	425	Typical Method - Underestimates runoff for areas with directly conn	
	Pervious Area		0.085				59	6.95	1.39	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.110					98	0.20	0.04	0.264	105	789	Calculates runoff from impervious area and pervious areas separatel	
	Weighted Volume Total									0.264	105	789		
	Runoff from Disconnected Imp Area	0.090					98	0.20	0.04	0.264	87	648		
	Equiv. Rain on Downstream Pervious Area (in) 0.28													
Roof Disconnected - Two-Sten Runoff Method	New Total Effective Rainfall Depth (in) 0.72												Calculates runoff from roof, then applies that runoff as "rainfall" to t	
Non Disconnected Two Step Kunon Method	Downstream Pervious Area Runoff		0.085				59	6.95	1.39	0.000	0	0	calculates ranon non root, then applies that ranon as rannal to t	
	Downstream Impervious Area Runoff	0.020					98	0.20	0.04	0.264	19	141		
	Weighted Volume Total										19	141		
Reduction in Runoff obtain	ed by disconnecting Roof										87	648		
						Soil Type B								
Undeveloped	(Desert, Fair)			0	0	72	72	3.89	0.78	0.000	0	0		
Developed (Composite Cu	Irve Number Approach)	0.110	0.085	57		87	93	0.75	0.15	0.080	57	425	Typical Method - Underestimates runoff for areas with directly conn	
	Pervious Area		0.085				74	3.51	0.70	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.110					98	0.20	0.04	0.264	105	789	Calculates runoff from impervious area and pervious areas separatel	
	Weighted Volume Total									0.264	105	789		
	Runoff from Disconnected Imp Area	0.090					98	0.20	0.04	0.264	87	648		
	Equiv. Rain on Downstream Pervious Area (in) 0.28													
Dest Discounded Test Class Dest(ChAshed	New Total Effective Rainfall Depth (in) 0.72													
Roof Disconnected - Two-Step Runoff Method	Downstream Pervious Area Runoff		0.085				74	3.51	0.70	0.000	0	0	Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Impervious Area Runoff	0.020					98	0.20	0.04	0.264	19	141		
	Weighted Volume Total										19	141		
Reduction in Runoff obtain	ed by disconnecting Roof										87	648		
	, ,					Soil Type C								
Undeveloped	(Desert, Fair)			0	0	81	81	2.35	0.47	0.000	0	0		
Developed (Composite Cu	urve Number Approach)	0.110	0.085	57		87	93	0.75	0.15	0.080	57	425	Typical Method - Underestimates runoff for areas with directly conn	
· · · · · · · · · · · · · · · · · · ·	Pervious Area		0.085				83	2.05	0.41	0.000	0	1	, , , , , , , , , , , , , , , , , , ,	
Roof Connected - Weighted Average Volume	Impervious Area	0.110					98	0.20	0.04	0.264	105	789	Calculates runoff from impervious area and pervious areas separatel	
	Weighted Volume Total									0.265	106	790		
	Runoff from Disconnected Imp Area	0.090					98	0.20	0.04	0.264	87	648		
	Equiv. Rain on Downstream Pervious Area (in) 0.28													
	New Total Effective Rainfall Depth (in) 0.72													
Roof Disconnected - Two-Step Runoff Method	Downstream Pervious Area Runoff		0.085				83	2.05	0.41	0.041	13	94	Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Impervious Area Runoff	0.020					98	0.20	0.04	0.264	19	141		
	Weighted Volume Total										31	235		
Reduction in Runoff obtain	ed by disconnecting Roof										74	555		
					•	Soil Type D								
Undeveloped	(Desert, Fair)			0	0	86	86	1.63	0.33	0.008	5	40		
Developed (Composite Cu	urve Number Approach)	0.110	0.085	57		87	93	0.75	0.15	0.080	57	425	Typical Method - Underestimates runoff for areas with directly conn	
	Pervious Area		0.085				87	1.49	0.30	0.012	4	28	······································	
Roof Connected - Weighted Average Volume	Impervious Area	0.110					98	0.20	0.04	0.264	105	789	Calculates runoff from impervious area and pervious areas separatel	
0	Weighted Volume Total									0.276	109	817		
	Runoff from Disconnected Imp Area	0.090					98	0.20	0.04	0,264	87	648		
	Equiv. Rain on Downstream Pervious Area (in) 0.28						50		2.51		57	2.10		
	New Total Effective Rainfall Depth (in) 0.72													
KOOT DISCONNECTED - TWO-Step Runoff Method	Downstream Pervious Area Runoff		0.085				87	1.49	0.30	0.093	28	213	Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Impervious Area Runoff	0,020					98	0.20	0.04	0.264	19	141		
	Weighted Volume Total	2.520						5120	2.01		47	353		
Reduction in Runoff obtain	ed by disconnecting Roof										62	463		



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Example Number	6
Zoning Type	Residential 1/4 Acre
Zoning ID	R-1-10

80th Percentile Storm Depth	0.44	in		
Total Area	0.286	acres	12450	sq ft
Roof	0.062	acres	2696	sq ft
Driveway/sidewalk	0.023	acres	992	sq ft
Other Impervious	0.013	acres	580	sq ft
Lawn	0.063	acres	2744	sq ft
Other Pervious	0.125	acres	5438	sq ft

Impervious	Areas			
otal Impervious Area Directly Connected // Roof connected // Roof disconnected	0.098	acres	4268	sq ft
	34%			
Directly Connected In	mpervious Area:	5		
w/ Roof connected	0.085	acres	3688	sq ft
w/ Roof disconnected	0.023	acres	992	sq ft
Unconnected Imp	ervious Areas			
w/ Roof connected	0.013	acres	580	sq ft
w/ Roof disconnected	0.075	acres	3276	sq ft

Curve nun	nbers			
Soil Type	A	В	С	D
Undeveloped (Desert, Fair)	55	72	81	86
Natural Desert Landscaping	63	77	85	88
Lawn	39	61	74	80
Impervious Areas	98	98	98	98
Composite Pervious Numbers for this lot	55	72	81	85

Variable Abbreviations						
A _{imp}	Impervious Area, acres					
A _{per}	Pervious Area, acres					
P _{imp}	Percent Impervious, %					
CN _p	Pervious Area Curve Number					
CN _c	Composite Curve Number					
S	Maxiumum Potential Retention, inches					
la	Initial Abstraction, inches					



					Volume NE	EH 630/TR	-55 Method	d						
Scenario D	escription	A _{imp}	A _{per}	P _{imp}	R	CN_p	CN _c	S	la		Volume		Comments	
		(acres)	(acres)	(%)	(%)	-	-	(in)	(in)	(in)	(cu ft)	(gal)		
						Soil Type A								
Undeveloped	(Desert, Fair)			(0 0	55	55	8.18	1.64	0.000	0	0		
Developed (Composite C	urve Number Approach)	0.098	0.188	34	1	85	89	1.24	0.25	0.026	27	202	Typical Method - Underestimates runoff for areas with directly connected and the second secon	
	Pervious Area		0.188				55	8.18	1.64	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.098					98	0.20	0.04	0.264	94	703	Calculates runoff from impervious area and pervious areas separatel	
	Weighted Volume Total									0.264	94	703		
	Runoff from Disconnected Imp Area	0.075					98	0.20	0.04	0.264	72	539		
	Equiv. Rain on Downstream Pervious Area (in) 0.11													
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.55												Calculates runoff from roof, then applies that runoff as "rainfall" to t	
·····	Downstream Pervious Area Runoff		0.188				55	8.18	1.64	0.000	0	0		
	Downstream Impervious Area Runoff	0.023					98	0.20	0.04	0.264	22	163		
	Weighted Volume Total										22	163		
Reduction in Runoff obtain	ned by disconnecting Roof										72	539		
						Soil Type B								
Undeveloped	(Desert, Fair)			(0 0	72	72	3.89	0.78	0.000	0	0		
Developed (Composite C	urve Number Approach)	0.098	0.188	34	1	85	89	1.24	0.25	0.026	27	202	Typical Method - Underestimates runoff for areas with directly conn	
	Pervious Area		0.188				72	3.89	0.78	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.098					98	0.20	0.04	0.264	94	703	Calculates runoff from impervious area and pervious areas separatel	
	Weighted Volume Total									0.264	94	703		
	Runoff from Disconnected Imp Area	0.075					98	0.20	0.04	0.264	72	539		
	Equiv. Rain on Downstream Pervious Area (in) 0.11													
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.55												Calculates runoff from roof then applies that runoff as "rainfall" to t	
	Downstream Pervious Area Runoff		0.188				72	3.89	0.78	0.000	0	0	calculates fundin non root, then applies that fundin as failinair to t	
	Downstream Impervious Area Runoff	0.023					98	0.20	0.04	0.264	22	163	1	
	Weighted Volume Total										22	163		
Reduction in Runoff obtain	ned by disconnecting Roof										72	539		
						Soil Type C								
Undeveloped	(Desert, Fair)			(0 0	81	81	2.35	0.47	0.000	0	0		
Developed (Composite C	urve Number Approach)	0.098	0.188	34	1	85	89	1.24	0.25	0.026	27	202	Typical Method - Underestimates runoff for areas with directly conn	
	Pervious Area		0.188				81	2.35	0.47	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.098					98	0.20	0.04	0.264	94	703	Calculates runoff from impervious area and pervious areas separatel	
	Weighted Volume Total									0.264	94	703		
	Runoff from Disconnected Imp Area	0.075					98	0.20	0.04	0.264	72	539		
	Equiv. Rain on Downstream Pervious Area (in) 0.11													
Deef Disserseted Two Stee Dweeff Method	New Total Effective Rainfall Depth (in) 0.55													
Root Disconnected - Two-Step Runott Method	Downstream Pervious Area Runoff		0.188				81	2.35	0.47	0.003	2	14	Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Impervious Area Runoff	0.023					98	0.20	0.04	0.264	22	163		
	Weighted Volume Total										24	177		
Reduction in Runoff obtain	ned by disconnecting Roof										70	526		
						Soil Type D				•				
Undeveloped	(Desert, Fair)			(0 0	86	86	1.63	0.33	0.008	8	58		
Developed (Composite C	urve Number Approach)	0.098	0.188	34	1	85	89	1.24	0.25	0.026	27	202	Typical Method - Underestimates runoff for areas with directly conn	
	Pervious Area		0.188				85	1.76	0.35	0.004	3	21		
Roof Connected - Weighted Average Volume	Impervious Area	0.098	0.100				98	0.20	0.04	0.264	94	703	Calculates runoff from impervious area and pervious areas separatel	
	Weighted Volume Total	0.050					50	0.20	5.04	0.268	97	724		
	Runoff from Disconnected Imp Area	0.075					90	0.20	0.04	0.264	72	520		
	Equiv. Bain on Downstream. Pervious Area (in)	0.075					58	0.20	0.04	0.204	72	555		
	New Total Effective Bainfall Depth (in)													
Roof Disconnected - Two-Step Runoff Method	Downstream Pervious Area Runoff		0 199				8c	1 76	0.35	0.020	12	101	Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Impenious Area Runoff	0.022	0.188				00	0.20	0.55	0.020	15	101		
	Weighted Volume Total	0.023					98	0.20	0.04	0.204	22	264		
Poduction in Punoff obtain	and by disconnecting Poof				1						35	204		
Reduction in RUNOTT ODTail	ieu by discollifectilig NOOI										01	459		



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Example Number	7
Zoning Type	Residential 1/4 Acre
Zoning ID	R-1-10

80th Percentile Storm Depth	0.44	in		
Total Area	0.007		0001	
Roof	0.227	acres	9881	sq ft sq ft
Driveway/sidewalk	0.063	acres	2764	sq ft
Other Impervious	0.006	acres	240	sq ft
Lawn	0.032	acres	1400	sq ft
Other Pervious	0.049	acres	2132	sq ft

Impervious Areas									
Total Importious Area	0.146	acres	6349	sq ft					
	64%								
Directly Connected Impervious Areas									
w/ Roof connected	0.140	acres	6109	sq ft					
w/ Roof disconnected	0.063	acres	2764	sq ft					
Unconnnected Impervious Areas									
w/ Roof connected	0.006	acres	240	sq ft					
w/ Roof disconnected	0.082	acres	3585	sq ft					

Curve numbers									
Soil Type	A	В	С	D					
Undeveloped (Desert, Fair)	55	72	81	86					
Natural Desert Landscaping	63	77	85	88					
Lawn	39	61	74	80					
Impervious Areas	98	98	98	98					
Composite Pervious Numbers for this lot	53	71	81	85					

	Variable Abbreviations
A _{imp}	Impervious Area, acres
A _{per}	Pervious Area, acres
P _{imp}	Percent Impervious, %
CN_p	Pervious Area Curve Number
CN _c	Composite Curve Number
S	Maxiumum Potential Retention, inches
la	Initial Abstraction, inches



Volume NEH 630/TR-55 Method														
		Δ.	Δ	P	R	CN.	CN.	s	la		Volume			
Scenario De	escription	(acres)	(acres)	(%)	(%)		-	(in)	(in)	(in)	(cu ft)	(gal)	Comments	
						Soil Type A								
Undeveloped (Desert, Fair)			0	0	55	55	8.18	1.64	0.000	0	0		
Developed (Composite Cu	rve Number Approach)	0.146	0.081	64		85	93	0.75	0.15	0.080	66	495	Typical Method - Underestimates runoff for areas with directly conne	
	Pervious Area		0.081				53	8.87	1.77	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.146					98	0.20	0.04	0.264	140	1045	Calculates runoff from impervious area and pervious areas separately	
	Weighted Volume Total									0.264	140	1045		
	Runoff from Disconnected Imp Area	0.082					98	0.20	0.04	0.264	79	590		
	Equiv. Rain on Downstream Pervious Area (in) 0.27													
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.71												Calculates runoff from roof, then applies that runoff as "rainfall" to t	
· · · · · · · · · · · · · · · · · · ·	Downstream Pervious Area Runoff		0.081				53	8.87	1.77	0.000	0	0	·····	
	Downstream Impervious Area Runoff	0.063					98	0.20	0.04	0.264	61	455		
	Weighted Volume Total										61	455		
Reduction in Runoff obtaine	ed by disconnecting Roof										79	590		
					r	Soil Type B								
Undeveloped (Desert, Fair)			0	0	72	72	3.89	0.78	0.000	0	0		
Developed (Composite Cu	rve Number Approach)	0.146	0.081	64		85	93	0.75	0.15	0.080	66	495	Typical Method - Underestimates runoff for areas with directly conne	
Design of the second state	Pervious Area		0.081				71	4.08	0.82	0.000	0	0	C.I. I.I	
Roof Connected - Weighted Average Volume	Impervious Area	0.146	-				98	0.20	0.04	0.264	140	1045	Calculates runoff from impervious area and pervious areas separatel	
	Weighted Volume Total									0.264	140	1045		
	Runoff from Disconnected Imp Area	0.082					98	0.20	0.04	0.264	79	590	4	
	Equiv. Rain on Downstream Pervious Area (in) 0.27													
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.71		0.004				74	4.00	0.02	0.000	0		Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Pervious Area Runoff	0.002	0.081				/1	4.08	0.82	0.000	0	0		
	Downstream Impervious Area Runoff	0.063					98	0.20	0.04	0.264	61	455		
Deduction in Dur off obtain	weighted volume rotal						-				51	455		
Reduction in Runon obtaine						Soil Type C					79	590		
				0	0	Soli Type C	01	2.25	0.47	0.000	0	0		
Developed (Composite Cu	Desert, Fair)	0.146	0.021	64	0	81	18	2.35	0.47	0.000	66	405	Typical Mathed Hadaractimator supoff for areas with directly consu	
	Pervious Area	0.140	0.081	04		65	95	2.75	0.13	0.080	00	495	Typical Method - Onderestimates runon for areas with directly conne	
Roof Connected - Weighted Average Volume		0.146	0.081				09	2.55	0.47	0.000	140	1045	Calculates runoff from impervious area and pervious areas separately	
Noor connected Weighted Weidge Volume	Weighted Volume Total	0.140					58	0.20	0.04	0.204	140	1045		
	Runoff from Disconnected Imp Area	0.082					98	0.20	0.04	0.204	79	590		
	Fourier Bain on Downstream Pervious Area (in)	0.002	-				50	0.20	0.04	0.204	,,,	550		
	New Total Effective Rainfall Depth (in) 0.71													
Roof Disconnected - Two-Step Runoff Method	Downstream Pervious Area Bunoff		0.081				81	2.35	0.47	0.022	7	49	Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Impervious Area Runoff	0.063					98	0.20	0.04	0.264	61	455		
	Weighted Volume Total										67	504		
Reduction in Runoff obtaine	ed by disconnecting Roof										72	541		
						Soil Type D								
Undeveloped (Desert, Fair)			0	0	86	86	1.63	0.33	0.008	6	46		
Developed (Composite Cu	rve Number Approach)	0.146	0.081	64		85	93	0.75	0.15	0.080	66	495	Typical Method - Underestimates runoff for areas with directly conne	
	Pervious Area		0.081				85	1.76	0.35	0.004	1	9		
Roof Connected - Weighted Average Volume	Impervious Area	0.146					98	0.20	0.04	0.264	140	1045	Calculates runoff from impervious area and pervious areas separately	
	Weighted Volume Total									0.268	141	1055		
	Runoff from Disconnected Imp Area	0.082					98	0.20	0.04	0.264	79	590		
	Equiv. Rain on Downstream Pervious Area (in) 0.27													
Roof Disconnected - Two-Sten Rupoff Method	New Total Effective Rainfall Depth (in) 0.71												Calculates runoff from roof, then applies that runoff as "rainfall" to t	
Nor Disconnected - Two-step Runon Method	Downstream Pervious Area Runoff		0.081				85	1.76	0.35	0.060	18	132	calculates runon non non root, then applies that runon as faithail to t	
	Downstream Impervious Area Runoff	0.063					98	0.20	0.04	0.264	61	455		
	Weighted Volume Total										79	587		
Reduction in Runoff obtained by disconnecting Roof											62	467		

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Example Number	8
Zoning Type	Residential 1/4 Acre
Zoning ID	R-1-10

80th Percentile Storm Depth	0.44	in		
Total Area	0.206	acres	8976	sq ft
Roof	0.075	acres	3255	sq ft
Driveway/sidewalk	0.033	acres	1417	sq ft
Other Impervious	0.010	acres	456	sq ft
Lawn	0.033	acres	1454	sq ft
Other Pervious	0.055	acres	2394	sq ft

Impervious Areas									
Total Imponious Area	0.118	acres	5128	sq ft					
	57%								
Directly Connected Impervious Areas									
w/ Roof connected	0.107	acres	4672	sq ft					
w/ Roof disconnected	0.033	acres	1417	sq ft					
Unconnnected Impervious Areas									
w/ Roof connected	0.010	acres	456	sq ft					
w/ Roof disconnected	0.085	acres	3711	sq ft					

Curve numbers									
Soil Type	A	В	С	D					
Undeveloped (Desert, Fair)	55	72	81	86					
Natural Desert Landscaping	63	77	85	88					
Lawn	39	61	74	80					
Impervious Areas	98	98	98	98					
Composite Pervious Numbers for this lot	54	71	81	85					

	Variable Abbreviations
A _{imp}	Impervious Area, acres
A _{per}	Pervious Area, acres
P _{imp}	Percent Impervious, %
CN _p	Pervious Area Curve Number
CN _c	Composite Curve Number
S	Maxiumum Potential Retention, inches
la	Initial Abstraction, inches



				\	/olume N	EH 630/TR-	55 Metho	d				
		Δ.	Α	Pima	R	CN.	CN.	S	la		Volume	
Scenario	Description	(acres)	(acres)	(%)	(%)	-	-	(in)	(in)	(in)	(cu ft)	Comments
						Soil Type A						
Undeveloped	d (Desert, Fair)			0	(55	55	8.18	1.64	0.000	0	0
Developed (Composite	Curve Number Approach)	0.118	0.088	57		85	92	0.87	0.17	0.062	47	349 Typical Method - Underestimates runoff for areas with directly conne
	Pervious Area		0.088				54	8.52	1.70	0.000	0	0
Roof Connected - Weighted Average Volume	Impervious Area	0.118					98	0.20	0.04	0.264	113	844 Calculates runoff from impervious area and pervious areas separately
	Weighted Volume Total									0.264	113	844
	Runoff from Disconnected Imp Area	0.085					98	0.20	0.04	0.264	82	611
	Equiv. Rain on Downstream Pervious Area (in) 0.25	i										
Roof Disconnected - Two-Sten Runoff Method	New Total Effective Rainfall Depth (in) 0.69)										Calculates runoff from roof then applies that runoff as "rainfall" to the
noor bisconnected " noo step nanon method	Downstream Pervious Area Runoff		0.088				54	8.52	1.70	0.000	0	
	Downstream Impervious Area Runoff	0.033					98	0.20	0.04	0.264	31	233
	Weighted Volume Total										31	233
Reduction in Runoff obta	ined by disconnecting Roof										82	611
						Soil Type B						
Undeveloped	d (Desert, Fair)			0	(72	72	3.89	0.78	0.000	0	0
Developed (Composite	Curve Number Approach)	0.118	0.088	57		85	92	0.87	0.17	0.062	47	349 Typical Method - Underestimates runoff for areas with directly conne
	Pervious Area		0.088				71	4.08	0.82	0.000	0	0
Roof Connected - Weighted Average Volume	Impervious Area	0.118					98	0.20	0.04	0.264	113	844 Calculates runoff from impervious area and pervious areas separately
	Weighted Volume Total									0.264	113	844
	Runoff from Disconnected Imp Area	0.085					98	0.20	0.04	0.264	82	611
Roof Disconnected - Two-Step Rupoff Method	Equiv. Rain on Downstream Pervious Area (in) 0.25	5										
	New Total Effective Rainfall Depth (in) 0.69)										Calculates runoff from roof then applies that runoff as "rainfall" to the
noor bisconnected " noo step nanon method	Downstream Pervious Area Runoff		0.088				71	4.08	0.82	0.000	0	
	Downstream Impervious Area Runoff	0.033					98	0.20	0.04	0.264	31	233
	Weighted Volume Total										31	233
Reduction in Runoff obta	ined by disconnecting Roof										82	611
						Soil Type C						
Undeveloped	d (Desert, Fair)			0	(81	81	2.35	0.47	0.000	0	0
Developed (Composite	Curve Number Approach)	0.118	0.088	57		85	92	0.87	0.17	0.062	47	349 Typical Method - Underestimates runoff for areas with directly conne
	Pervious Area		0.088				81	2.35	0.47	0.000	0	0
Roof Connected - Weighted Average Volume	Impervious Area	0.118					98	0.20	0.04	0.264	113	844 Calculates runoff from impervious area and pervious areas separately
	Weighted Volume Total									0.264	113	844
	Runoff from Disconnected Imp Area	0.085					98	0.20	0.04	0.264	82	611
	Equiv. Rain on Downstream Pervious Area (in) 0.25	5										
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.69)										Calculates runoff from roof, then applies that runoff as "rainfall" to the
··· ··· ····	Downstream Pervious Area Runoff		0.088				81	2.35	0.47	0.019	6	46
	Downstream Impervious Area Runoff	0.033					98	0.20	0.04	0.264	31	233
	Weighted Volume Total										37	279
Reduction in Runoff obta	ined by disconnecting Roof										76	565
						Soil Type D						
Undeveloped	d (Desert, Fair)			0	(86	86	1.63	0.33	0.008	6	42
Developed (Composite	Curve Number Approach)	0.118	0.088	57		85	92	0.87	0.17	0.062	47	349 Typical Method - Underestimates runoff for areas with directly conner
	Pervious Area		0.088				85	1.76	0.35	0.004	1	10
Roof Connected - Weighted Average Volume	Impervious Area	0.118					98	0.20	0.04	0.264	113	844 Calculates runoff from impervious area and pervious areas separately
	Weighted Volume Total									0.268	114	854
	Runoff from Disconnected Imp Area	0.085					98	0.20	0.04	0.264	82	611
	Equiv. Rain on Downstream Pervious Area (in) 0.25	5										
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.69	9										Calculates runoff from roof, then applies that runoff as "rainfall" to the
	Downstream Pervious Area Runoff		0.088				85	1.76	0.35	0.054	17	130
	Downstream Impervious Area Runoff	0.033					98	0.20	0.04	0.264	31	233
	Weighted Volume Total										49	363
Reduction in Runoff obtained by disconnecting Roof											66	491

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Example Number	9
Zoning Type	Residential 1/4 Acre
Zoning ID	R-1-10

80th Percentile Storm Depth	0.44	in		
Total Area	0.260	acres	11320	sq ft
Roof	0.072	acres	3147	sq ft
Driveway/sidewalk	0.081	acres	3548	sq ft
Other Impervious	0.009	acres	380	sq ft
Lawn	0.059	acres	2550	sq ft
Other Pervious	0.039	acres	1695	sq ft

Impervious Areas							
Total Importious Area	0.162	acres	7075	sq ft			
rotal impervious Area	63%						
Directly Connected Impervious Areas							
w/ Roof connected	0.154	acres	6695	sq ft			
w/ Roof disconnected	0.081	acres	3548	sq ft			
Unconnnected Impervious Areas							
w/ Roof connected	0.009	acres	380	sq ft			
w/ Roof disconnected	0.081	acres	3527	sq ft			

Curve numbers						
Soil Type	A	В	С	D		
Undeveloped (Desert, Fair)	55	72	81	86		
Natural Desert Landscaping	63	77	85	88		
Lawn	39	61	74	80		
Impervious Areas	98	98	98	98		
Composite Pervious Numbers for this lot	49	67	78	83		

	Variable Abbreviations
A _{imp}	Impervious Area, acres
A _{per}	Pervious Area, acres
P _{imp}	Percent Impervious, %
CN _p	Pervious Area Curve Number
CN _c	Composite Curve Number
S	Maxiumum Potential Retention, inches
la	Initial Abstraction, inches



				١	Volume N	EH 630/TR	-55 Metho	d						
Connection	Description	Aimo	Aner	Pimp	R	CN _p	CN _c	S	la		Volume			
Scenario	Description	(acres)	(acres)	(%)	(%)	-	-	(in)	(in)	(in)	(cu ft)	(gal)	iments	
						Soil Type A								
Undeveloped	d (Desert, Fair)			0		0 55	55	8.18	1.64	0.000	0	0		
Developed (Composite	Curve Number Approach)	0.16	2 0.097	63		83	92	0.87	0.17	0.062	59	440 Typical Method - Underestimates runoff for areas with o	directly conne	
	Pervious Area		0.097	•			49	10.41	2.08	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.16	2				98	0.20	0.04	0.264	156	1165 Calculates runoff from impervious area and pervious are	eas separately	
	Weighted Volume Total									0.264	156	1165		
	Runoff from Disconnected Imp Area	0.08	1				98	0.20	0.04	0.264	78	581		
	Equiv. Rain on Downstream Pervious Area (in)	.22												
Roof Disconnected - Two-Sten Runoff Method	New Total Effective Rainfall Depth (in)	.66										Calculates runoff from roof, then applies that runoff as	"rainfall" to th	
noor bisconnected " noo step nanon method	Downstream Pervious Area Runoff		0.097	•			49	10.41	2.08	0.000	0			
	Downstream Impervious Area Runoff	0.08	1				98	0.20	0.04	0.264	78	584		
	Weighted Volume Total										78	584		
Reduction in Runoff obta	ined by disconnecting Roof										78	581		
						Soil Type B								
Undeveloped	d (Desert, Fair)			0		0 72	72	3.89	0.78	0.000	0	0		
Developed (Composite	Curve Number Approach)	0.16	2 0.097	63		83	92	0.87	0.17	0.062	59	440 Typical Method - Underestimates runoff for areas with o	directly conne	
	Pervious Area		0.097	•			67	4.93	0.99	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.16	2				98	0.20	0.04	0.264	156	1165 Calculates runoff from impervious area and pervious are	eas separately	
	Weighted Volume Total									0.264	156	1165		
	Runoff from Disconnected Imp Area	0.08	1				98	0.20	0.04	0.264	78	581		
	Equiv. Rain on Downstream Pervious Area (in)	.22												
Roof Disconnected - Two-Sten Runoff Method	Roof Disconnected - Two-Sten Runoff Method New Total Effective Rainfall Depth (in) 0.66							Calculates runoff from roof, then applies that runoff as	"rainfall" to th					
noor bisconnected " noo step nanon method	Downstream Pervious Area Runoff		0.097	·			67	4.93	0.99	0.000	0			
	Downstream Impervious Area Runoff	0.08	1				98	0.20	0.04	0.264	78	584		
	Weighted Volume Total										78	584		
Reduction in Runoff obta	ined by disconnecting Roof										78	581		
						Soil Type C								
Undeveloped	d (Desert, Fair)			0		0 81	81	2.35	0.47	0.000	0	0		
Developed (Composite	Curve Number Approach)	0.16	2 0.097	63		83	92	0.87	0.17	0.062	59	440 Typical Method - Underestimates runoff for areas with o	directly conne	
	Pervious Area		0.097	•			78	2.82	0.56	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.16	2				98	0.20	0.04	0.264	156	1165 Calculates runoff from impervious area and pervious are	eas separately	
	Weighted Volume Total									0.264	156	1165		
	Runoff from Disconnected Imp Area	0.08	1				98	0.20	0.04	0.264	78	581		
	Equiv. Rain on Downstream Pervious Area (in)	.22												
Roof Disconnected - Two-Sten Runoff Method	New Total Effective Rainfall Depth (in)	.66										Calculates runoff from roof, then applies that runoff as	"rainfall" to ti	
	Downstream Pervious Area Runoff		0.097	·			78	2.82	0.56	0.003	1	8		
	Downstream Impervious Area Runoff	0.08	1				98	0.20	0.04	0.264	78	584		
	Weighted Volume Total										79	593		
Reduction in Runoff obta	ined by disconnecting Roof										77	572		
						Soil Type D								
Undeveloped	d (Desert, Fair)			0		0 86	86	1.63	0.33	0.008	7	53		
Developed (Composite	Curve Number Approach)	0.16	2 0.097	63		83	92	0.87	0.17	0.062	59	440 Typical Method - Underestimates runoff for areas with o	directly conne	
	Pervious Area		0.097	•			83	2.05	0.41	0.000	0	1	Calculates runoff from impervious area and pervious areas separately	
Roof Connected - Weighted Average Volume	Impervious Area	0.16	2				98	0.20	0.04	0.264	156	1165 Calculates runoff from impervious area and pervious are		
	Weighted Volume Total									0.265	156	1166		
	Runoff from Disconnected Imp Area	0.08	1				98	0.20	0.04	0.264	78	581		
	Equiv. Rain on Downstream Pervious Area (in)	.22												
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in)	.66										Calculates runoff from roof, then applies that runoff as	"rainfall" to th	
	Downstream Pervious Area Runoff		0.097	·			83	2.05	0.41	0.027	10	72		
	Downstream Impervious Area Runoff	0.08	1				98	0.20	0.04	0.264	78	584		
	Weighted Volume Total										88	656		
Reduction in Runoff obta	ined by disconnecting Roof										68	510		

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Example Number	10
Zoning Type	Residential 1/8 Acre
Zoning ID	R-1-6

80th Percentile Storm Depth	0.44	in		
Total Area	0.120	acres	5225	sq ft
Roof	0.049	acres	2155	sq ft
Driveway/sidewalk	0.017	acres	722	sq ft
Other Impervious	0.011	acres	479	sq ft
Lawn	0.017	acres	762	sq ft
Other Pervious	0.025	acres	1107	sq ft

Impervious Areas							
Total Impervious Area	0.077	acres	3356	sq ft			
	64%						
Directly Connected Impervious Areas							
w/ Roof connected	0.066	acres	2878	sq ft			
w/ Roof disconnected	0.017	acres	722	sq ft			
Unconnnected Impervious Areas							
w/ Roof connected	0.011	acres	479	sq ft			
w/ Roof disconnected	0.060	acres	2634	sq ft			

Curve numbers						
Soil Type	A	В	С	D		
Undeveloped (Desert, Fair)	55	72	81	86		
Natural Desert Landscaping	63	77	85	88		
Lawn	39	61	74	80		
Impervious Areas	98	98	98	98		
Composite Pervious Numbers for this lot	53	70	81	85		

	Variable Abbreviations			
A _{imp}	A _{imp} Impervious Area, acres			
A _{per}	Pervious Area, acres			
P _{imp}	Percent Impervious, %			
CN _p	Pervious Area Curve Number			
CN _c	Composite Curve Number			
S	Maxiumum Potential Retention, inches			
la	Initial Abstraction, inches			



				V	olume N	EH 630/TR	-55 Method	d						
Scenario D	escription	A _{imp}	A _{per}	P _{imp}	R	CN_p	CN _c	S	la		Volume		Comments	
		(acres)	(acres)	(%)	(%)	-	-	(in)	(in)	(in)	(cu ft)	(gal)		
						Soil Type A								
Undeveloped	(Desert, Fair)			0	0	55	55	8.18	1.64	0.000	0	0		
Developed (Composite C	urve Number Approach)	0.077	0.043	64		85	93	0.75	0.15	0.080	35	262	Typical Method - Underestimates runoff for areas with directly conne	
Roof Connected Weighted Average Volume	Pervious Area	0.077	0.043				53	8.87	1.//	0.000	0	0	Calculates runoff from imporvious area and populous areas constrately	
Kool connected - weighted Average volume	Impervious Area	0.077					98	0.20	0.04	0.264	74	553	calculates fution from impervious area and pervious areas separately	
	weighted volume lotal	0.000						0.20	0.04	0.264	74	553		
	Runoff from Disconnected Imp Area	0.060					98	0.20	0.04	0.264	58	434		
	Equiv. Rain on Downstream Pervious Area (in) 0.3	1												
Roof Disconnected - Two-Step Runoff Method	New Total Elective Rainian Depth (in) 0.8	L	0.042				52	0.07	1 77	0.000	0	0	Calculates runoff from roof, then applies that runoff as "rainfall" to the	
	Downstream Pervious Area Runoff	0.017	0.043				53	8.87	1.77	0.000	16	110	•	
	Weighted Volume Tetal	0.017					30	0.20	0.04	0.204	10	119	•	
Reduction in Runoff obtain	weighted volume fotal										59	119		
Reduction in Kunon obtain						Soil Tupo P					50	434		
المعتما متراجعا ا		T		0		3011 Type B	70	2.00	0.70	0.000	0	0		
Developed (Composite C	(Desert, Fair)	0.077	0.043	0	U	72	/2	3.89	0.78	0.000	25	262	Tunical Method - Underectimates runoff for areas with directly some	
Developed (composite c	Pervious Area	0.077	0.043	04		65	35	4.20	0.13	0.080	33	202	Typical Method - Onderestimates runon for areas with directly conne	
Roof Connected - Weighted Average Volume	Impervious Area	0.077	0.045				70	4.29	0.80	0.000	74	U	Calculates runoff from impervious area and nervious areas senaratel	
Noor connected - weighted Average volume	Weighted Volume Tetal	0.077					30	0.20	0.04	0.264	74	555	calculates runon mon impervious area and pervious areas separately	
	Runoff from Disconnected Imp Area	0.060					0.9	0.20	0.04	0.264	59	12/		
	Equiv. Pain on Downstream. Pervious Area (in)	0.000					38	0.20	0.04	0.204	58	434		
	New Total Effective Painfall Depth (in)	1												
Roof Disconnected - Two-Step Runoff Method	Downstream Penvious Area Runoff	L	0.043				70	4 29	0.86	0.000	0	0	Calculates runoff from roof, then applies that runoff as "rainfall" to the	
	Downstream Impervious Area Bunoff	0.017	0.045				98	0.20	0.00	0.264	16	119		
	Weighted Volume Total	0.017					58	0.20	0.04	0.204	16	119		
Reduction in Runoff obtain	weighted volume ford					1					58	434		
						Soil Type C					50	101		
Lindeveloped	(Desert Fair)	1		0	0	81	81	2 35	0.47	0.000	0	0		
Developed (Composite C	urve Number Approach)	0.077	0.043	64		85	93	0.75	0.15	0.080	35	262	Typical Method - Underestimates runoff for areas with directly conne	
	Pervious Area		0.043				81	2.35	0.47	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.077					98	0.20	0.04	0.264	74	553	Calculates runoff from impervious area and pervious areas separately	
с с	Weighted Volume Total									0.264	74	553		
	Runoff from Disconnected Imp Area	0.060					98	0.20	0.04	0.264	58	434		
	Equiv. Rain on Downstream Pervious Area (in) 0.3	7												
	New Total Effective Rainfall Depth (in) 0.8	1												
Roof Disconnected - Two-Step Runoff Method	Downstream Pervious Area Runoff		0.043				81	2.35	0.47	0.043	7	50	Calculates runoff from roof, then applies that runoff as "rainfall" to the	
	Downstream Impervious Area Runoff	0.017					98	0.20	0.04	0.264	16	119		
	Weighted Volume Total										23	169		
Reduction in Runoff obtair	ned by disconnecting Roof										51	383		
		•	•			Soil Type D	•							
Undeveloped	(Desert, Fair)			0	C	86	86	1.63	0.33	0.008	3	24		
Developed (Composite C	urve Number Approach)	0.077	0.043	64		85	93	0.75	0.15	0.080	35	262	Typical Method - Underestimates runoff for areas with directly conne	
	Pervious Area		0.043				85	1.76	0.35	0.004	1	5		
Roof Connected - Weighted Average Volume	Impervious Area	0.077					98	0.20	0.04	0.264	74	553	Calculates runoff from impervious area and pervious areas separately	
	Weighted Volume Total									0.268	75	557		
	Runoff from Disconnected Imp Area	0.060					98	0.20	0.04	0.264	58	434		
	Equiv. Rain on Downstream Pervious Area (in) 0.3	7												
Deef Discovered Two Stee Duroff Marked	New Total Effective Rainfall Depth (in) 0.8	1												
KUUI DISCONNECTED - I WO-STEP KUNOTT METHOD	Downstream Pervious Area Runoff		0.043				85	1.76	0.35	0.094	15	110	calculates runoff from roof, then applies that runoff as "rainfall" to th	
	Downstream Impervious Area Runoff	0.017					98	0.20	0.04	0.264	16	119		
	Weighted Volume Total										31	228		



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Example Number	11
Zoning Type	Residential 1/8 Acre
Zoning ID	R-1-6

80th Percentile Storm Depth	0.44	in		
Total Area	0.142	acres	6166	sq ft
Roof	0.054	acres	2333	sq ft
Driveway/sidewalk	0.016	acres	699	sq ft
Other Impervious	0.011	acres	475	sq ft
Lawn	0.025	acres	1093	sq ft
Other Pervious	0.036	acres	1566	sq ft

Impervious Areas									
Total Impervious Area	0.081	acres	3507	sq ft					
	57%								
Directly Connected Impervious Areas									
w/ Roof connected	0.070	acres	3032	sq ft					
w/ Roof disconnected	0.016	acres	699	sq ft					
Unconnnected Impervious Areas									
w/ Roof connected	0.011	acres	475	sq ft					
w/ Roof disconnected	0.064	acres	2808	sq ft					

Curve numbers									
Soil Type	A	В	С	D					
Undeveloped (Desert, Fair)	55	72	81	86					
Natural Desert Landscaping	63	77	85	88					
Lawn	39	61	74	80					
Impervious Areas	98	98	98	98					
Composite Pervious Numbers for this lot	53	70	80	85					

	Advantabile Albie - Jacka -
	Variable Abbreviations
A _{imp}	Impervious Area, acres
A _{per}	Pervious Area, acres
P _{imp}	Percent Impervious, %
CN _p	Pervious Area Curve Number
CN _c	Composite Curve Number
S	Maxiumum Potential Retention, inches
la	Initial Abstraction, inches



				Vo	olume N	EH 630/TR-	55 Metho	bd						
Sconario Do	conintion	Aimo	Aner	Pimp	R	CN _p	CN _c	S	la		Volume		Commonte	
Scenario De	Scription	(acres)	(acres)	(%)	(%)	-	-	(in)	(in)	(in)	(cu ft)	(gal)	comments	
		_				Soil Type A								
Undeveloped (Desert, Fair)			0	0	55	55	8.18	1.64	0.000	0	0		
Developed (Composite Cu	rve Number Approach)	0.081	0.061	57		85	92	0.87	0.17	0.062	32	240	Typical Method - Underestimates runoff for areas with directly conn	
	Pervious Area		0.061				53	8.87	1.77	0.000	0	0		
Roof Connected - Weighted Average Volume	Impervious Area	0.081					98	0.20	0.04	0.264	77	577	Calculates runoff from impervious area and pervious areas separatel	
	Weighted Volume Total		-							0.264	77	577		
	Runoff from Disconnected Imp Area	0.064					98	0.20	0.04	0.264	62	462		
	Equiv. Rain on Downstream Pervious Area (in) 0.2	8												
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.7	2									-		Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Pervious Area Runoff		0.061				53	8.87	1.77	0.000	0	0		
	Downstream Impervious Area Runoff	0.016	•				98	0.20	0.04	0.264	15	115		
Deduction in Descrift sharts	Weighted Volume Total										15	115		
Reduction in Runoff obtaine	ed by disconnecting Roof										62	462		
		1	1	- 1		Soil Type B		T		[- 1	_		
Undeveloped (Desert, Fair)		0.001	0	0	72	72	3.89	0.78	0.000	0	0		
Developed (Composite Cu	rve Number Approach)	0.081	0.061	57		85	92	0.87	0.17	0.062	32	240	Typical Method - Underestimates runoff for areas with directly conne	
Deef Connected Minishted Average Malvers	Pervious Area		0.061			-	/0	4.29	0.86	0.000	0	0	Calculates runoff from impervious area and pervious areas separate	
Roof Connected - weighted Average volume	Impervious Area	0.081				-	98	0.20	0.04	0.264	//	577		
	Weighted Volume Total					-				0.264	11	577		
	Runoff from Disconnected Imp Area	0.064	•			-	98	0.20	0.04	0.264	62	462		
	Equiv. Rain on Downstream Pervious Area (in) 0.2	3												
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.7	2	0.001				70	4.20	0.90	0.000	0	0	Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Pervious Area Runott	0.010	0.061			-	70	4.29	0.86	0.000	0	0		
	Downstream Impervious Area Runoff	0.016					98	0.20	0.04	0.264	15	115		
Deduction in Desettion in the	weighted volume lotal	-									15	115		
Reduction in Runoil obtaine	a by disconnecting Rooi					Soil Turno C					62	402		
the device of the						Soli Type C		2.25	0.47	0.000				
Undeveloped (Desert, Fair)	0.001	0.001	0	U	81	81	2.35	0.47	0.000	0	0	Tuning Mathed Hadevestimates an off for every with directly one	
Developed (composite cu		0.081	0.061	57		65	92	0.87	0.17	0.062	32	240	Typical Method - Onderestimates runon for areas with directly conne	
Roof Connected - Weighted Average Volume		0.091	0.001				00	2.30	0.30	0.000	77	E77	Calculates runoff from impervious area and nervious areas senaratel	
Noor connected - weighted Average volume	Misished Values Tatal	0.081	•				98	0.20	0.04	0.264	77	577	calculates fution from impervious area and pervious areas separater	
	Weighted volume Total	0.004					00	0.20	0.04	0.264		577		
	Runon from Disconnected imp Area	0.064	•			 	98	0.20	0.04	0.264	02	402		
	New Total Effective Painfall Depth (in)	2												
Roof Disconnected - Two-Step Runoff Method	Downstream Penzious Area Runoff	<u></u>	0.061			-	80	2.50	0.50	0.018	1	20	Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Impensious Area Runoff	0.016	0.001				30	0.20	0.50	0.018	4	115		
	Weighted Volume Total	0.010					38	0.20	0.04	0.204	19	115		
Reduction in Runoff obtaine	ad by disconnecting Roof	1				1					58	433		
			1			Soil Type D					50	100		
Lindeveloped (Desert Fair)			0	0	3011 Type B	86	1.63	0 33	0.008	4	29		
Developed (Composite Cu	n/e Number Approach)	0.081	0.061	57		85	92	0.87	0.33	0.008	32	240	Typical Method - Underestimates rupoff for areas with directly copp	
Developed (composite cu	Pervious Area	0.081	0.001	57		85	95	1.76	0.17	0.002	32	7	Typical Method - Onderestimates runon for areas with directly comm	
Roof Connected - Weighted Average Volume	Impervious Area	0.081	0.001				09	0.20	0.35	0.004	77	577	Calculates runoff from impervious area and pervious areas separatel	
noor connected theighted therage tolante	Weighted Volume Total	0.081	•				50	0.20	0.04	0.204	78	584		
	Runoff from Disconnected Imp Area	0.064					9.0	0.20	0.04	0.208	62	462		
	Equiv. Bain on Downstream. Pervious Area (in)	3					50	0.20	0.04	0.204	02	402		
	New Total Effective Rainfall Depth (in)	2												
Root Disconnected - Two-Step Runoff Method	Downstream Pervious Area Runoff		0.061			1	85	1.76	0.35	0.063	14	105	Calculates runoff from roof, then applies that runoff as "rainfall" to t	
	Downstream Impervious Area Runoff	0.016	0.001				90	0.20	0.04	0.264	14	115		
	Souther can impervious Area Nation	0.010					58	0.20	0.04	0.204	15	115		
	Weighted Volume Total										20	220		



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Example Number	12
Zoning Type	Residential 1/8 Acre
Zoning ID	R-1-6

80th Percentile Storm Depth	0.44	in		
Total Area	0.120	acres	5219	sq ft
Roof	0.048	acres	2097	sq ft
Driveway/sidewalk	0.017	acres	750	sq ft
Other Impervious	0.002	acres	104	sq ft
Lawn	0.019	acres	806	sq ft
Other Pervious	0.034	acres	1463	sq ft

Impervious Areas									
Total Imponious Area	0.068	acres	2951	sq ft					
Total Impervious Area	57%								
Directly Connected Impervious Areas									
w/ Roof connected	0.065	acres	2847	sq ft					
w/ Roof disconnected	0.017	acres	750	sq ft					
Unconnnected Impervious Areas									
w/ Roof connected	0.002	acres	104	sq ft					
w/ Roof disconnected	0.051	acres	2201	sq ft					

Curve nun	nbers			
Soil Type	A	В	С	D
Undeveloped (Desert, Fair)	55	72	81	86
Natural Desert Landscaping	63	77	85	88
Lawn	39	61	74	80
Impervious Areas	98	98	98	98
Composite Pervious Numbers for this lot	54	71	81	85

	Variable Abbreviations
A _{imp}	Impervious Area, acres
A _{per}	Pervious Area, acres
P _{imp}	Percent Impervious, %
CN _p	Pervious Area Curve Number
CN _c	Composite Curve Number
S	Maxiumum Potential Retention, inches
la	Initial Abstraction, inches



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UniteUnitU	Scenario D)escription	A _{imp}	A _{per}	P _{imp}	R	CN _p	CN _c	S	la		Volume		Comments	
			(acres)	(acres)	(%)	(%)	-	-	(in)	(in)	(in)	(cu ft)	(gal)		
$ \begin{array}{ $			T	1	1	T	Soil Type A					· · · · ·			
Obeland Langels Controls of Langels Controls Controls of Langels Controls Cont	Undeveloped	(Desert, Fair)			C	0 0	55	55	8.18	1.64	0.000	0	0		
http://weigned.augo value image: im	Developed (Composite C	Curve Number Approach)	0.068	0.052	57	'	85	92	0.87	0.17	0.062	27	203	Typical Method - Underestimates runoff for areas with directly conne	
Image: Marging and and any and any and any and any angle of the second of the seco	Deef Connected Minishted Average Malvers	Pervious Area		0.052				54	8.52	1.70	0.000	0	0		
$ \begin{aligned} \begin{aligned} & $	Roor connected - weighted Average volume		0.068	5				98	0.20	0.04	0.264	65	486	Calculates runoit from impervious area and pervious areas separatel	
And the same shows that is a single show if is a single show i		Weighted Volume Lotal	0.054						0.20	0.04	0.264	65	486		
Med bounded: Main and a mode of a mo		Runoff from Disconnected Imp Area	0.051	-				98	0.20	0.04	0.264	48	362		
Red Busonedici - Two Steps and Main Legan 0,1 0,2 0,4 0,4 0,0 0,0 0,0 Red Busonedici - Two Steps and Main Legan 0,0 0,0 0,0 0,0 0,0 0,0 Weighter Values Instruct And Main Value Values Instruct Main 0,0 0,0 0,0 0,0 0,0 0,0 Red Busonedici - Two Steps and Main 0,0 0,0 0,0 0,0 0,0 0,0 0,0 Red Steps - Two Steps and Main 0,0 0,0 0,0 0,0 0,0 0,0 0,0 Red Steps - Two Steps and Main 0,00 0,0 0,0 0,0 0,0 0,0 0,0 Red Steps - Two Steps and Main 0,00 0,0 0,0 0,0 0,0 0,0 0,0 Red Steps - Two Steps and Main 0,00 0,0 0,0 0,0 0,0 0,0 0,0 Red Steps - Two Steps and Main 0,00 0,0 0,0 0,0 0,0 0,0 0,0 Red Steps - Two Steps and Main 0,00 0,0 0,0 0,0 0,0 0,0 0,0 Red Steps - Two Steps and Main 0,00 0,0 0,0 0,0 0,0 0,0 0,0 Red Steps - Two Steps and Mai		Equiv. Rain on Downstream Pervious Area (in) 0.26												•	
Description for the formation of the form	Roof Disconnected - Two-Step Runoff Method			0.053				5.4	0.52	1.70	0.000	-		Calculates runoff from roof, then applies that runoff as "rainfall" to t	
Indicate Values Value		Downstream Pervious Area Runoff	0.017	0.052				54	8.52	1.70	0.000	10	122	•	
Integrate of the set		Downstream Impervious Area Runon	0.017	·				98	0.20	0.04	0.264	10	123		
Add/tilt Solit	Deduction in Duraff abtain	weighted volume lotal	-				-					16	123		
Understand (b) (c) (c) (c) (c)	Reduction in Runoil obtain						Cult Turk D					48	302		
Durbage in the last interval Area Oot O O O O		/m · m ·)	1				Soli Type B	=0	0.00	0.70					
Decompose (unify mode (unify mode) (unify mod) (unify mode) (unify mode) (unify mode) (unify mode)	Undeveloped	(Desert, Fair)	0.000	0.053	0		/2	/2	3.89	0.78	0.000	0	0	The fact that the state of the	
Bod Conception Average Volume Imperiod Outs	Developed (Composite C	Depuique Area	0.068	0.052	57	<u> </u>	85	92	0.87	0.17	0.062	27	203	Typical Method - Underestimates runoff for areas with directly conne	
Not Contracts Note Toyle Note	Roof Connected Weighted Average Volume	Impopulaus Area	0.000	0.052				/1	4.08	0.82	0.000	0	0	Calculates runoff from impervious area and pervious areas separate	
Image: State interaction interactin interaction interaction interaction interaction intera	Roof Connected - weighted Average volume	Impervious Area	0.068	5				98	0.20	0.04	0.264	65	486		
$ \begin{aligned} \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $		Weighted Volume Total									0.264	65	486		
Bod Disconcted - Two Step Runoff Method Bod State Method Method Data Description		Runoff from Disconnected Imp Area	0.051	-				98	0.20	0.04	0.264	48	362	4	
Not Disconnected - Two Step Rundf Methods Area Rundf (m) 0.00		Equiv. Rain on Downstream Pervious Area (in) 0.26													
Image: Device of the share of the	Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.70		0.053				74	4.00	0.02	0.000			Calculates runoff from roof, then applies that runoff as "rainfall" to t	
Imperiods refail		Downstream Pervious Area Runoff	0.047	0.052				/1	4.08	0.82	0.000	0	0		
Add the function in Runoff abilities by discovere line by discovere		Downstream Impervious Area Runoff	0.017					98	0.20	0.04	0.264	16	123		
Network handly didaled by societicity gold Image: Society of the s		Weighted Volume Total										16	123		
Undeveloped (Desert, Far) Image: Constrained in the Agrication in the Agricatio	Reduction in Runoff obtain	ned by disconnecting Roof										48	362		
Understeped [desert, fair) 0 0 81 2.5 0.47 0.05 0 0 Developed (composite Curve Number Agnicadh) 0.052 0 0.52 0.55 0.27 0.05 0 <td< td=""><td></td><td>(=))</td><td>1</td><td>1</td><td></td><td></td><td>Soli Type C</td><td> 1</td><td> </td><td></td><td></td><td></td><td></td><td></td></td<>		(=))	1	1			Soli Type C	1							
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Undeveloped	(Desert, Fair)	0.000	0.053	0	0 0	81	81	2.35	0.47	0.000	0	0	The first state of the descent state of the	
$ \begin{aligned} & envious Area weighted Average Volume Volum$	Developed (Composite C	urve Number Approach)	0.068	0.052	57	, 	85	92	0.87	0.17	0.062	27	203	Typical Method - Underestimates runoff for areas with directly conner	
Noti Culties weighe Volume Impervous Area Outs	Deef Connected Misished Average Values			0.052				81	2.35	0.47	0.000	0	0		
Weighted Volume Total Image: Second Se	Roof Connected - weighted Average volume	Impervious Area	0.068	3				98	0.20	0.04	0.264	65	486	Calculates runoff from impervious area and pervious areas separatel	
Rund from Disconnected ling Area 0.05		Weighted Volume Total									0.264	65	486		
Edux. Nam on Downstream Vervous Area (no) 0.0 0 <td></td> <td>Runoff from Disconnected Imp Area</td> <td>0.051</td> <td>-</td> <td></td> <td></td> <td></td> <td>98</td> <td>0.20</td> <td>0.04</td> <td>0.264</td> <td>48</td> <td>362</td> <td></td>		Runoff from Disconnected Imp Area	0.051	-				98	0.20	0.04	0.264	48	362		
Reof Disconnected - Two-Step Runoff Method Not al Effective Runafial Depth (in) 0.002 0.003 0.002 0.003 0.002 0.003 0.002 0.003 0.002 0.003 0.002 0.003 0.004 0.005 0.003 0.004 0.005 0.003 0.004 0.005 0.003 0.004 0.005 0.004 0.005 0.004 0.005 0.005 0.005		Equiv. Rain on Downstream Pervious Area (in) 0.26													
$ \begin{array}{ $	Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.70												Calculates runoff from roof, then applies that runoff as "rainfall" to t	
Downstream impervous Area kunoff 0.01/ 0.01/ 0 0 0.04 0.04 0.04 10 123 Weighted Volume Total 0 </td <td></td> <td>Downstream Pervious Area Runoff</td> <td></td> <td>0.052</td> <td></td> <td></td> <td></td> <td>81</td> <td>2.35</td> <td>0.47</td> <td>0.021</td> <td>4</td> <td>29</td> <td></td>		Downstream Pervious Area Runoff		0.052				81	2.35	0.47	0.021	4	29		
Weighted Volume Iotal Veighted Volume		Downstream Impervious Area Runoff	0.017					98	0.20	0.04	0.264	16	123		
Reduction in Runoff obtained by disconnecting Roof I	Deducted in Description	Weighted Volume Total										20	153		
Solitype 0 Solitype 0 Developed (Composite Curre Number Approach) 0 <th cols<="" td=""><td>Reduction in Kunoff obtain</td><td>ned by disconnecting Roof</td><td></td><td></td><td></td><td></td><td>Coll Toron D</td><td></td><td></td><td></td><td></td><td>45</td><td>333</td><td></td></th>	<td>Reduction in Kunoff obtain</td> <td>ned by disconnecting Roof</td> <td></td> <td></td> <td></td> <td></td> <td>Coll Toron D</td> <td></td> <td></td> <td></td> <td></td> <td>45</td> <td>333</td> <td></td>	Reduction in Kunoff obtain	ned by disconnecting Roof					Coll Toron D					45	333	
Ondeveloped (Desert, Fair) O <tho< td=""><td></td><td>/m</td><td>1</td><td>1</td><td></td><td></td><td>Soli Type D</td><td></td><td>1.50</td><td></td><td></td><td></td><td></td><td></td></tho<>		/m	1	1			Soli Type D		1.50						
Developed (Composite Curve Number Approach) 0.068 0.052 57 85 92 0.17 0.062 27 203 Number Approach Roof Connected - Weighted Average Volume Impervious Area 0.052 57 0.85 92 0.87 0.17 0.062 27 203 Number Approach 0	Undeveloped	(Desert, Fair)			0) (86	86	1.63	0.33	0.008	3	24		
Roof Connected - Weighted Average Volume Impervious Area 0.052 8 1.6 0.35 0.004 1 6 More Yous Area 0.052 0.052 0 0.05 0.05 0.05 0.05 0.004 1 6 Weighted Volume Total Veighted Volume Total 0 0 0 0 0.056 66 4492 Roof Disconnected Imp Area 0.051 0 0 0 98 0.00 0.04 0.264 66 4492 Roof Disconnected Imp Area 0.052 0 0 98 0.00 0.04 0.264 48 362 Weighted Yolume Total 0.052 0 0 0 0 0 0 0 0.057 1 1 Downstream Pervious Area Runoff 0.017 0 0 0 8 0.05 0.057 1 1 Downstream Impervious Area Runoff 0.017 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Developed (Composite C	urve Number Approach)	0.068	0.052	57	·	85	92	0.87	0.17	0.062	27	203	Typical Method - Underestimates runoff for areas with directly conne	
Root Connected - Weighted Volume Imperiods Area 0.068 0 98 0.0 0.04 0.264 65 486 Calculates fundit from imperiods area and periods area and periods area separate Meighted Volume Total 0.051 0 0 0.264 65 489 Roof Disconnected Imp Area 0.051 0 98 0.20 0.04 0.264 48 362 New Total Effective Rainfall Depth (in) 0.70 0<	Deef Connected Minishted Average Malvers			0.052				85	1.76	0.35	0.004	1	6		
Weighted Volume Total O <t< td=""><td>Root Connected - weighted Average volume</td><td>Impervious Area</td><td>0.068</td><td>3</td><td></td><td></td><td></td><td>98</td><td>0.20</td><td>0.04</td><td>0.264</td><td>65</td><td>486</td><td>Calculates runoff from impervious area and pervious areas separatel</td></t<>	Root Connected - weighted Average volume	Impervious Area	0.068	3				98	0.20	0.04	0.264	65	486	Calculates runoff from impervious area and pervious areas separatel	
Roof Disconnected in parea 0.051 98 0.0 0.06 362 Equiv. Rain on Downstream Pervious Area (into) 0.05 0		Weighted Volume Total									0.268	66	492		
Roof Disconnected - Two-Step Runoff Method Pervious Area (un) 0.0 0.0 0 <t< td=""><td></td><td>Runoff from Disconnected Imp Area</td><td>0.051</td><td>-</td><td></td><td></td><td></td><td>98</td><td>0.20</td><td>0.04</td><td>0.264</td><td>48</td><td>362</td><td></td></t<>		Runoff from Disconnected Imp Area	0.051	-				98	0.20	0.04	0.264	48	362		
New lotal Effective kannall Depth (in) 0.0 0		Equiv. Kain on Downstream Pervious Area (in) 0.26													
Downstream Periods Area Runoff 0.052 85 1.76 0.35 0.057 11 11 Downstream Impervious Area Runoff 0.017 0 9 0.02 0.04 0.26 16 12 Weighted Volume Total 0 0 0 0 0 0 20 204 Reduction in Runoff obtained by disconnecting Roof 0 0 0 0 38 288	Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.70								a				Calculates runoff from roof, then applies that runoff as "rainfall" to t	
Downstream Impervious Area Runoff 0.017 98 0.00 0.04 0.16 123 Weighted Volume Total Image: Constraint of the second se		Downstream Pervious Area Runoff		0.052				85	1.76	0.35	0.057	11	81		
Weighted Volume Total Image: Constraint of the second constraint of the sec		Downstream Impervious Area Runoff	0.017					98	0.20	0.04	0.264	16	123		
Reduction in Kunoff obtained by disconnecting Koof		Weighted Volume Total										27	204		
	Reduction in Runoff obtain	ned by disconnecting Roof										38	288		



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Example Number	13
Zoning Type	Townhomes
Zoning ID	PUD

80th Percentile Storm Depth	0.44	in		
Total Area	12.767	acres	556120	sq ft
Roof	2.817	acres	122706	sq ft
Driveway/sidewalk	3.689	acres	160710	sq ft
Other Impervious	0.599	acres	26108	sq ft
Lawn	0.325	acres	14151	sq ft
Other Pervious	5.336	acres	232444	sq ft

Impervious Areas								
Total Importious Area	7.106	acres	309525	sq ft				
	56%							
Directly Connected Impervious Areas								
w/ Roof connected	6.506	acres	283416	sq ft				
w/ Roof disconnected	3.689	acres	160710	sq ft				
Unconnnected Impervious Areas								
w/ Roof connected	0.599	acres	26108	sq ft				
w/ Roof disconnected	3.416	acres	148815	sq ft				

Curve numbers							
Soil Type	A	В	С	D			
Undeveloped (Desert, Fair)	55	72	81	86			
Natural Desert Landscaping	63	77	85	88			
Lawn	39	61	74	80			
Impervious Areas	98	98	98	98			
Composite Pervious Numbers for this lot	62	76	84	88			

Variable Abbreviations						
A _{imp} Impervious Area, acres						
A _{per}	Pervious Area, acres					
P _{imp}	Percent Impervious, %					
CN_p	Pervious Area Curve Number					
CN _c	Composite Curve Number					
S	Maxiumum Potential Retention, inches					
la	Initial Abstraction, inches					



					Volume N	EH 630/TR	-55 Metho	d					
Scenario De	escription	A _{imp}	A _{per}	P _{imp}	R	CN_p	CN _c	S	la		Volume		Comments
		(acres)	(acres)	(%)	(%)	-	-	(in)	(in)	(in)	(cu ft)	(gal)	
				1	-	Soil Type A	· · · · · ·						
Undeveloped	(Desert, Fair)			(0 0	55	55	8.18	1.64	0.000	0	0	
Developed (Composite Cu	irve Number Approach)	7.106	5 5.661	56	5	88	94	0.64	0.13	0.103	4756	35576	Typical Method - Underestimates runoff for areas with directly conne
	Pervious Area		5.661				62	6.13	1.23	0.000	0	0	
Roof Connected - Weighted Average Volume	Impervious Area	7.106	5				98	0.20	0.04	0.264	6813	50966	Calculates runoff from impervious area and pervious areas separately
	Weighted Volume Total									0.264	6813	50966	
	Runoff from Disconnected Imp Area	3.416	5				98	0.20	0.04	0.264	3276	24504	
	Equiv. Rain on Downstream Pervious Area (in) 0.16												
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.60												Calculates runoff from roof, then applies that runoff as "rainfall" to t
	Downstream Pervious Area Runoff		5.661				62	6.13	1.23	0.000	0	0	
	Downstream Impervious Area Runoff	3.689	9				98	0.20	0.04	0.264	3538	26463	
	Weighted Volume Total										3538	26463	
Reduction in Runoff obtain	ed by disconnecting Roof										3276	24504	
						Soil Type B	-						
Undeveloped	(Desert, Fair)			(0 0	72	72	3.89	0.78	0.000	0	0	
Developed (Composite Cu	irve Number Approach)	7.106	5.661	56	5	88	94	0.64	0.13	0.103	4756	35576	Typical Method - Underestimates runoff for areas with directly conne
	Pervious Area		5.661				76	3.16	0.63	0.000	0	0	
Roof Connected - Weighted Average Volume	Impervious Area	7.106	5				98	0.20	0.04	0.264	6813	50966	Calculates runoff from impervious area and pervious areas separate
	Weighted Volume Total									0.264	6813	50966	
	Runoff from Disconnected Imp Area	3.416	5				98	0.20	0.04	0.264	3276	24504	
	Equiv. Rain on Downstream Pervious Area (in) 0.16												
Roof Disconnected - Two-Step Runoff Method	New Total Effective Rainfall Depth (in) 0.60												Calculates runoff from roof, then applies that runoff as "rainfall" to the
Noor Disconnected Two Step Nation Interiod	Downstream Pervious Area Runoff		5.661				76	3.16	0.63	0.000	0	0	
	Downstream Impervious Area Runoff	3.689	9				98	0.20	0.04	0.264	3538	26463	
	Weighted Volume Total										3538	26463	
Reduction in Runoff obtain	ed by disconnecting Roof										3276	24504	
						Soil Type C							
Undeveloped ((Desert, Fair)			(0 0	81	81	2.35	0.47	0.000	0	0	
Developed (Composite Cu	irve Number Approach)	7.106	5 5.661	56	5	88	94	0.64	0.13	0.103	4756	35576	Typical Method - Underestimates runoff for areas with directly conne
	Pervious Area		5.661				84	1.90	0.38	0.002	36	273	
Roof Connected - Weighted Average Volume	Impervious Area	7.106	5				98	0.20	0.04	0.264	6813	50966	Calculates runoff from impervious area and pervious areas separately
	Weighted Volume Total									0.266	6850	51239	
	Runoff from Disconnected Imp Area	3.416	5				98	0.20	0.04	0.264	3276	24504	
	Equiv. Rain on Downstream Pervious Area (in) 0.16												
Deef Discovered Two Stee Dweeff Method	New Total Effective Rainfall Depth (in) 0.60												
Koor Disconnected - Two-Step Kunon Method	Downstream Pervious Area Runoff		5.661				84	1.90	0.38	0.023	464	3473	calculates runon from root, then applies that runon as rainfail to th
	Downstream Impervious Area Runoff	3.689)				98	0.20	0.04	0.264	3538	26463	
	Weighted Volume Total										4002	29935	
Reduction in Runoff obtain	ed by disconnecting Roof										2848	21304	
						Soil Type D							
Undeveloped	(Desert, Fair)			(0 0	86	86	1.63	0.33	0.008	348	2605	
Developed (Composite Cu	Irve Number Approach)	7.106	5 5.661	56	5	88	94	0.64	0.13	0.103	4756	35576	Typical Method - Underestimates runoff for areas with directly conne
	Pervious Area		5.661				88	1.36	0.27	0.018	376	2810	
Roof Connected - Weighted Average Volume	Impervious Area	7.106	5				98	0.20	0.04	0.264	6813	50966	Calculates runoff from impervious area and pervious areas separately
	Weighted Volume Total									0.282	7189	53776	
	Runoff from Disconnected Imp Area	3.416	5				98	0.20	0.04	0.264	3276	24504	
	Equiv. Rain on Downstream Pervious Area (in) 0.16												
	New Total Effective Rainfall Depth (in) 0.60												
Koof Disconnected - Two-Step Runoff Method	Downstream Pervious Area Runoff		5,661				88	1,36	0.27	0,063	1302	9737	Calculates runoff from roof, then applies that runoff as "rainfall" to t
	Downstream Impervious Area Runoff	3.689	9				98	0.20	0.04	0.264	3538	26463	
	Weighted Volume Total	5.005				1	50	0.20	0.04	0.204	4839	36200	
Reduction in Runoff obtain	ed by disconnecting Boof		1		1						2350	17576	

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